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THE MUSICAL POSSIBILITIES OF CHOMSKY'S DEEP STRUCTURE: A SEARCH FOR PARALLEL STRUCTURES IN MUSIC ANALYSIS

by

ELIZABETH JACOB

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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ABSTRACT

Recent trends in music theory have involved the use of linguistic techniques for the analysis of music. This paper will explore one area of that field to determine whether the idea functions in music and is relevant to the study of music structure.

The linguistic technique examined here will be the transformational model of Noam Chomsky. A brief outline of the tenets of that theory will be given in Chapter Two. Emphasis in the paper will be placed upon the concept of "deep structure," its meaning and its function. In order to apply this concept to music, the paper will first specify the nature of musical meaning as it will apply throughout the paper.

The analytic methods used to describe deep structure in music are based upon the grammar of tonal music put forth by Lerdahl and Jackendoff in their work. Allan Keiler's ideas on harmonic constituent structure will form a major part of that aspect of musical structure. The methods put forth will be applicable to tonal music of the common-practice period. No attempt will be made to describe a deep structure for other musical idioms, though the concluding chapter includes some speculation on the

prerequisites for the existence of a deep structure.

The means by which the musical deep structure is related to the musical surface - transformations - is discussed in some detail in Chapter Five. Both the general function of the concept in music as well as some specific transformational operations are covered in the chapter.

Finally, the practical use of the concept in an analytic situation is explored in Chapter Six. It is concluded that its use is helpful to show explicitly certain aspects of structure but in general the concept would function best as an adjunct to, not a replacement for more traditional forms of analysis.

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CHAPTER ONE : INTRODUCTION

In recent years the notable similarities between language and music have inspired a body of work using techniques from linguistics to analyze music. These analyses range from the distributional approach favored by Jean-Jacques Nattiez[1] to variations on the generative-transformational model of Noam Chomsky.[2]

Central to the use of linguistic techniques for music analysis is the conception of music as a syntactically organized sound system. This implies a number of levels of structural organization which may be similar to those found in the organization of language. It is the view of many linguists, Chomsky among them, that an understanding of the structural organization of a language forms a necessary basis for the study of the more abstract area of meaning. In a similar manner, a thorough understanding of the structural organization of a piece of music is an important prerequisite to any examination of musical "meaning."

What can linguistics bring to the study of music? Foremost, in detailing the structure of language linguists use rigorous scientific methods, which, when applied to the analysis of music, can bring a degree of objectivity uncommon in more traditional music analysis. This objective approach can function as a common meeting ground for more

diverse styles of analysis. If one can precisely define the object of analysis, one is better equipped to understand the variations and idiosyncracies brought to light by other analyses.

In this paper, one particular model of linguistic structure will be explored with reference to its possible function in music; the transformational model of Noam Chomsky. Transformational grammar attempts to provide an explicit description of the structure of all the possible sentences of a language. These structural descriptions provide all the information necessary to generate further examples of the language. The grammar itself is not a map of the mechanism for generating sentences.

The structural description indicates how the sentences of a language are understood by the ideal speaker-hearer. This concept of ideal or native speaker-hearer is closely allied with another idea, important to an understanding of Chomsky's theory, that of linguistic competence. In its simplest form, competence is defined as the knowledge that native speakers possess which enables them to produce and understand sentences. Defined as such, competence is distinct from performance, which involves the strategies the individual employs as he applies his linguistic competence in the actual production and comprehension of sentences.

Performance thus involves a variety of factors, pertinent only on an individual level. For example, a

speaker-hearer's ability to understand and produce sentences could be limited by unfamiliarity with vocabulary found in the sentences. This factor has no bearing on the structural makeup of the sentences in question and a grammar of the language need not take this factor into account. Nicolas Ruwet describes performance as follows:

> Performance is in general only an indirect reflection of the competence of speaker-hearers. Indeed the "speech acts" of speaker-hearers do not depend solely on their linguistic competence, they vary also as a function of a large number of other factors such as memory, attention, the degree of interest in the subject matter, the desire for expressiveness, emotional factors etc. 4

Chomsky confines his perspective to detailing the underlying competence involved in the production of sentences. He furthermore feels that "On the contrary, it is difficult to see how performance can be seriously studied except on the basis of an explicit theory of the competence that underlies it."[5]

It is competence, the internalized knowledge of language structure that native speakers possess, that enables them to understand the structure of sentences, not just a particular one in question, but others of a similar nature that they may encounter in the future. Chomsky states it thusly:

> The most striking aspect of linguistic competence is what we may call the "creativity of language," that is the speaker's ability to produce new sentences, sentences that are immediately understood by other speakers although they bear no physical resemblance to sentences which are familiar. 6

How does this concept function in musical terms? There is no exact duplicate of the linguistic native speaker, since music is not anyone's mother tongue. (However within music itself, one could consider a particular music such as the western tonal tradition to be a musical mother tongue.) In general though, the closest correlation to the ideal speaker would be what we may refer to as the "educated listener."

There are a number of skills which the native speaker is considered to possess. These include the ability to distinguish grammatical and ungrammatical utterances; to interpret sentences where elements may not be physically present, merely implied; to recognize ambiguity and synonymity; to perceive the structure of sentences; and to produce and comprehend a theoretically infinite number of sentences.[7]

The definition of an educated listener would be a person who, because of long familiarity with music, is able to understand basic musical functions. Examples of some basic functions would be distinguishing between repetition and variation; identifying basic musical features such as cadences; inferring a triadic harmony when all elements are not present, for example in a two-part invention, and so on. These ideas are very similar to those with which a native speaker is involved.

Musical competence, then, would be the knowledge of musical syntax that listeners possess which enables them

to "understand" a piece of music.

By concentrating on detailing the underlying structure when analyzing a musical work, one is able to arrive at an objective view of a piece. This objective view can serve as a point of reference for the variety of opinions resulting from analyses describing the structure as the analyst perceived it, or as the composer might have intended it, or perhaps the structure that the listener is able to comprehend. When describing musical competence, the analyst does not have to be concerned with what an inividual perceives (a matter of performance), or with the psychology of perception. Whether or not a listener perceives a structure does not alter the fact that the structure exists. (A more interesting point might be to discuss why the listener does or does not perceive a particular structure.)

Allan Keiler points out the benefit of studying musical competence distinct from references to what listeners do or do not perceive. "Indeed it would be impossible to form intelligent questions about perceptual theories or strategies without first having precise ideas about the nature of the perceived object."[8]

To return to lingusitics, Chomsky says that a grammar attempts to state all the knowledge that a native speaker unconsciously uses to understand sentences. Chomsky has described his grammar as consisting of three components: the syntactic, the semantic and the phonological.[9] The syntactic

component describes for each sentence of the language a deep structure which determines the semantic interpretation of the sentence and a surface structure which determines the phonological interpretation of the sentence.[10]

This paper will focus on that part of a grammar which will describe deep structure. It will explain the way in which listeners organize musical sound into coherent patterns to determine the meaning of a musical utterance. It will examine whether some aspects of musical structure are felt to contribute more to the structural meaning of a work. Those aspects of musical structure which are felt to determine the "meaning" of a musical work will be described by a deep structure. This paper will explore how a knowledge of deep structure can be used in an analytical situation.

An attempt to describe a transformational grammar of music will not be made here. Jackendoff and Lerdahl have addressed the difference between analyses and a grammar of music in their article on discovery procedures. "The class of analytic statements about the stimulus object, i.e. the structural description of a sentence, is not by any means identical to the grammar. . . the grammar is rather a systematic description of pairings between stimulus objects and analytic statements about them."[11]

Neither is this paper an attempt to furnish discovery procedures -- a method for deriving the grammar of a corpus of musical objects. Chomsky himself has said that

such discovery procedures are beyond the scope of transformational grammar.[12] The object of this paper is to determine whether a deep structure functions in music; what aspects of music contribute to the deep structure and how a knowledge of this concept can be used fruitfully in the analysis of music.

NOTES

[1]See Jean-Jacques Nattiez, Fondements d'une semiologie de la musique (Paris: Union Generale d'Editions, 1975), for a comprehensive explanation of his theories.

[2]Noam Chomsky, Syntactic Structures (The Hague: Mouton and Company, 1957), and Aspects of the Theory of Syntax (Cambridge: MIT Press, 1965).

[3]Chomsky, Aspects of the Theory, pp. 3-4.

[4]Nicolas Ruwet, An Introduction to Generative Grammar, translated by Norval S.H. Smith (Amsterdam: North-Holland Publishing Company, 1973), p. 6.

[5]Noam Chomsky, Chomsky: Selected Readings, edited by J.P.B. Allen and Paul Van Buren (London: Oxford University Press, 1971), p. 7.

[6]Ibid., p. 8.

[7]Diane Borstein, An Introduction to Transformational Grammar (Cambridge: Winthrop Publishers, 1977), p. 36.

[8]Allan R. Keiler, "The Empiricist Illusion: Narmour's Beyond Schenkerism," Perspectives of New Music, 17 (1978-79): 195.

[9]Chomsky, Aspects of the Theory, p. 16.

[10]Ibid.

[11]Ray Jackendoff and Fred Lerdahl, "Discovery Procedures vs. Rules of Musical Grammar," Perspectives of New Music, 18 (1979-80): 504.

[12]Chomsky, Syntactic Structures, pp. 49-56.

CHAPTER TWO : TRANSFORMATIONAL GRAMMAR

Before determining whether there is a deep structure operating in music, it is necessary to understand the concept and its function as part of Chomsky's transformational grammar. To that end, this chapter will outline the general format of Chomsky's grammar, and the types of constructions that may also function in music.

Chomsky has described his grammar as consisting of three components: the syntactic, the semantic and the phonological. The syntactic component is further subdivided into a base component containing phrase structure rules and a lexicon, and a transformational component. For each sentence, the syntactic component of the grammar will describe a deep structure, founded on the base component, and a surface structure which results from the application of the transformational component.

Transformational grammar is based on constituent type analysis of sentences. Each sentence is diagrammed as consisting of a variety of grammatical categories, e.g. NP, VP. These categories are subdivided and several words of a sentence may be considered as constituents of one grammatical category. Phrase structure rules, also known as rewriting or branching rules,[1] are the means used to show these grammatical relations. The basic rule

takes the form X $\longrightarrow$ Y + Z which reads "X may be rewritten as Y plus Z." Each rewriting rule may expand only one element at a time, that element always being placed to the left of the arrow.

The phrase structure rules generate "strings" of abstract grammatical categories. At this point each string can represent a very large number of sentences. Lexical entries are placed into the positions occupied by the abstract symbols in the string.[2] When a string contains only symbols which cannot be further broken down by rewriting rules, it is called a terminal string.[3]

Figure 2.1 shows the phrase structure rules which would generate the sentence "The boy hit the ball."[4]

Figure 2.1: Phrase Structure Rules

S

S $\longrightarrow$ NP + VP (noun phrase plus verb phrase)

VP $\longrightarrow$ V + NP

NP $\longrightarrow$ Det + N (determiner plus noun)

Det $\longrightarrow$ the

N $\longrightarrow$ boy, ball

V $\longrightarrow$ hit

Figure 2.2 shows the derivational history of the same sentence[5] - that being the order in which the phrase structure rules were applied. Another common method of showing the structure of a sentence is a tree diagram, also called a phrase marker, shown in Figure 2.3.[6] In a tree diagram,

Figure 2.2: Derivational History

NP + VP

NP + V + NP

Det + N + V + NP

Det + N + V + Det + N

the + N + V + Det + N

the + N + V + the + N

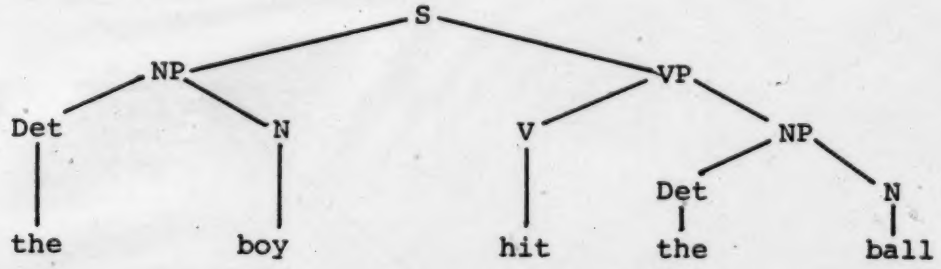
the + boy + V + the + N

the + boy + V + the + ball

the + boy + hit + the + ball

The branching points are called nodes and each is connected by lines to the node which dominates it or the ones it dominates.

Figure 2.3: Tree Diagram



For instance, in Figure 2.3, S would be said to dominate NP and VP, while NP would dominate Det and N and so forth.

Although differing in format, derivational histories and tree diagrams outline essentially the same structure, except that a derivational history indicates the order in which the phrase structure rules were applied to generate the sentence. In more complex sentences, the

order of the rules might not be evident from the phrase marker alone.

Besides branching rules, the grammar contains other types of rules such as subcategorization rules and selectional restrictions. These rules relate to the co-occurrence of grammatical categories and lexical items, and they assure that the words introduced into strings of symbols will result in a grammatical sentence. The rules are expressed as part of the lexicon of the grammar.[7] (Also included in the lexicon would be the definitions of words, their idiosyncratic properties, such as irregular plurals of nouns or past tense forms of verbs, and the phonetic forms of words.)

The other part of the syntactic component of Chomsky's grammar is the transformational component. One of the main motivations for the development of transformational grammar was the desire to simplify the description of syntax. Another important aspect of a transformational component is that it can show the relation between sentences whose surface structures appear to be radically different. A prime example is that of active and passive sentences. Though conveying the same idea semantically, the two sentences involve highly divergent surface structures. A transformational grammar can eliminate the need for a variety of phrase structure rules dealing with the specific environment of a passive verb,

and can also show the relation of the two sentences on a deep structure level.

Chomsky himself has mentioned these and other benefits of the transformational model.

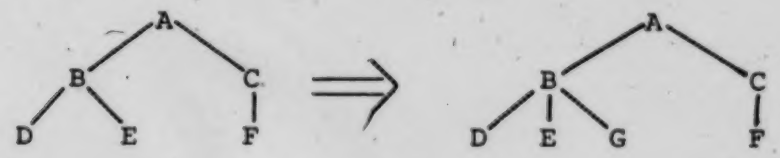
> In other words, certain linguistic behavior that seems unmotivated and inexplicable in terms of phrase structure appears simple and systematic when we adopt the transformational point of view. 8 Transformational analysis brings out the fact that negatives and interrogatives have fundamentally the same "structure" and it can make use of this fact to simplify the description of English syntax. 9 There are many other cases in which the behavior of a sentence under transformation provides valuable, even compelling evidence as to its constituent structure. 10

A transformation is defined as a grammatical process that operates on a string of words and symbols with a particular constituent structure and converts it into a new string. The statement of a transformation consists of the structural description, also called the structural index, which specifies the trees to be affected by the rule (the input trees), and the structural change which associates each input tree with an output tree.[11]

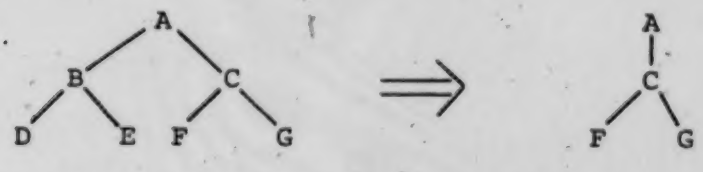
The transformational rule uses a double-shafted arrow with the structural index on the left-hand side and the structural change on the right. Transformational rules can perform four basic operations: adjunction, deletion, substitution and permutation. Examples of all four operations are shown in Figure 2.4. (The single line used in the adjunction and substitution operations indicates E and F are located on separate nodes.) For

Figure 2.4: Transformational Operations[12]

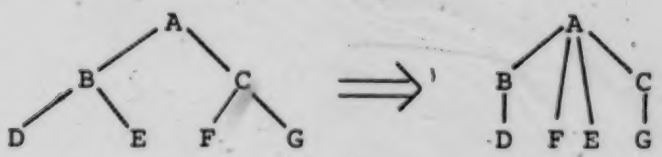
Adjunction: D + E ___ F ⇒ D + E + G ___ F



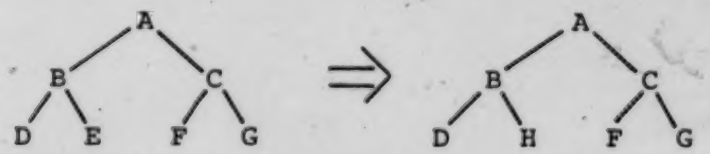
Deletion: B + C ⇒ C



Permutation: D + E + F ⇒ D + F + E



Substitution: D + E ___ F ⇒ D + H ___ F



the adjunction operation, the added string is adjoined to the right or left of a string at the lowest node that dominates that string in the source p-marker. For deletion, the string to be deleted, as well as any nodes that it uniquely dominates, and any nodes uniquely dominating it, are deleted from the source p-marker. Permutation involves two strings that are adjacent constituents, rearranged in relation to each other. The strings are detached, permuted in the proper order, and reattached

to the last node which dominated both in the source p-marker. With substitution, one (or more than one) string of a given p-marker is replaced by a different string attached in the same place.

Transformations involve one or more of the four operations. For example, the interrogative transformation involves permutation of elements: the verb is moved to the beginning of the sentence; while the imperative transformation involves the deletion of the subject noun phrase. Transformations may operate on part of a string (called a local transformation), on one whole string (called an elementary or simple transformation), or on two or more strings. This last category of transformations is called double-base or generalized transformation and it provides the recursive power of the language. There are two main types of generalized transformations, those involving conjunction of strings and those involving the embedding of one string into another.

The conjunction transformation is based upon the p-rule $S \rightarrow S^n$, which reads "any sentence can be rewritten as two or more sentences without limit." The transformation is written as follows:

$$\begin{matrix} NP __ VP \\ NP_1 __ VP_1 \end{matrix} \Longrightarrow NP __ VP + and + NP_1 __ VP_1$$

Because sentence types generally cannot be mixed, the two phrase markers should have the same general structure.

There are a number of variations on the conjunction transformation allowing for the deletion of items if two noun phrases are the same or the two verb phrases the same and so forth.

The embedding transformation works from the p-rule NP $\longrightarrow$ NP + S (a noun phrase may be rewritten as a noun phrase plus an embedded sentence). The sentence into which another is embedded is called the matrix sentence. The most common type of embedding in English is the relative clause. In this case, the embedded and matrix sentences must contain an identical noun phrase. The noun phrase is replaced by a relative pronoun which is moved to the front of the embedded sentence. The rule is as follows:

$$X + NP_1 + A + NP_2 + B + Y \Rightarrow X + NP_1 + \overset{\text{relative}}{\text{pronoun}} + A + B + Y$$

$X + NP_1 + Y$ is the matrix sentence and $A + NP_2 + B$ is the embedded sentence. (X, Y, A and B represent the parts of the sentence before and after the noun phrase.) Again, there can also be reductions as in some cases where the relative pronoun can be deleted.

The base and transformational components together compose the grammatical description of the language. The structure of individual sentences is defined by two phrase markers, one showing the deep structure of the sentence and the other the surface structure.

The two levels of structure allow one to show

explicitly structures that may not be apparent on the surface of the sentence. By examining the deep structure level, one can see the similarities between sentences with surface structures that are highly divergent and can trace the means by which the sentence was transformed. Such sentences seem to have a regular underlying structure which has been significantly altered through transformation.

Nicolas Ruwet comments further on this point.

> The underlying phrase markers which are generated by the phrase structure rules alone, will have, generally speaking, a very regular (binary) structure. . . . As for the derived phrase markers, which result from the application of transformations and in particular permutations, these will have a much looser structure. Permutations thus will have a distorting effect: they lead, so to speak, to the concealment of the relations represented in the underlying phrase markers. The transformational theory thus allows one to retain what is correct in immediate constituent analysis and the empirical fact that actual sentences are at first sight much less structured. 13

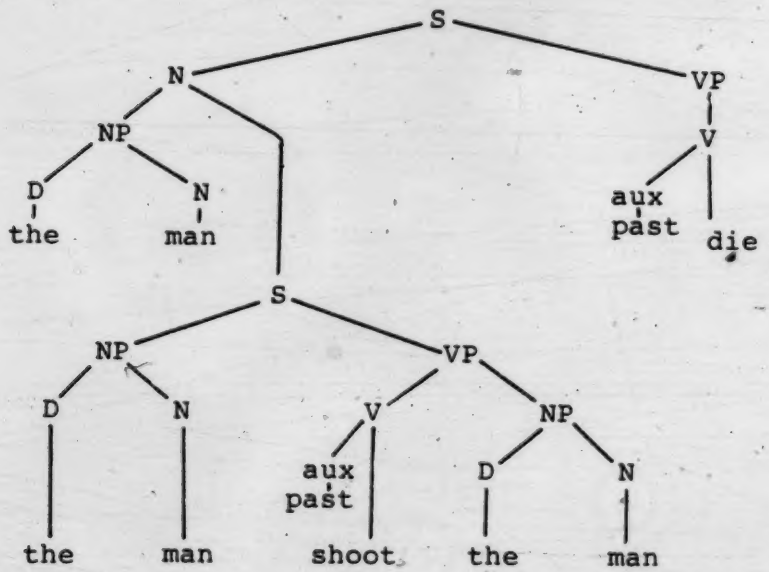
Figures 2.5 and 2.6 show the deep and surface structure p-markers for two different sentences. Figure 2.5 shows the two p-markers for a sentence with an embedded relative clause. Figure 2.6 is an example of paraphrase, in this instance, the active and passive versions of a simple sentence.

Figure 2.7 concerns the concept of structural ambiguity.[14] The sentence, "John painted the car in the garage.", could have two possible meanings depending upon

Figure 2.5 : Phrase Markers for an Embedded Sentence

The man who shot himself died.

Deep Structure



Surface Structure

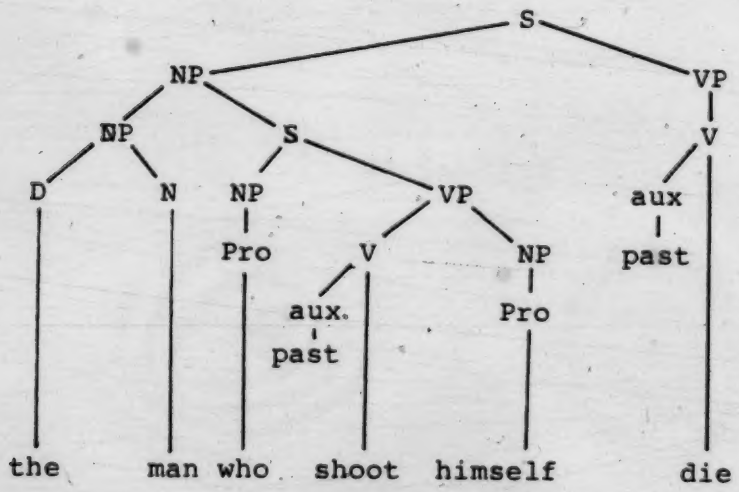
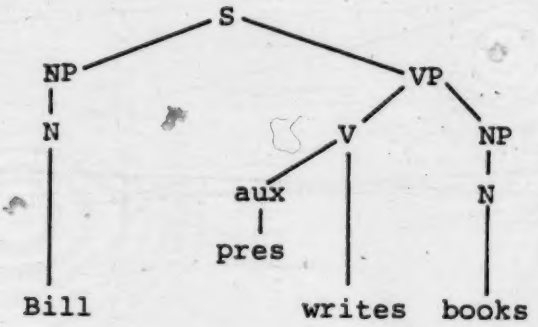


Figure 2.6: P-markers for Active and Passive Sentences

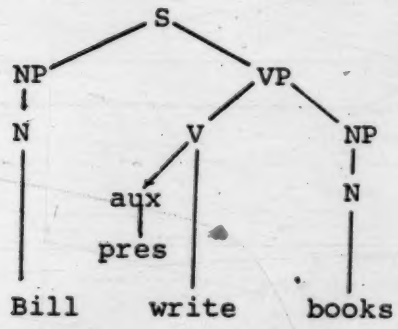
Bill writes books.

Deep and Surface Structures

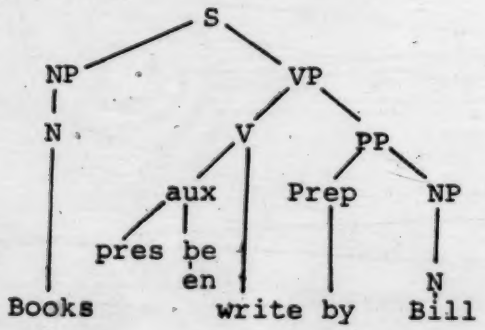


Books are written by Bill.#

Deep Structure



Surface Structure

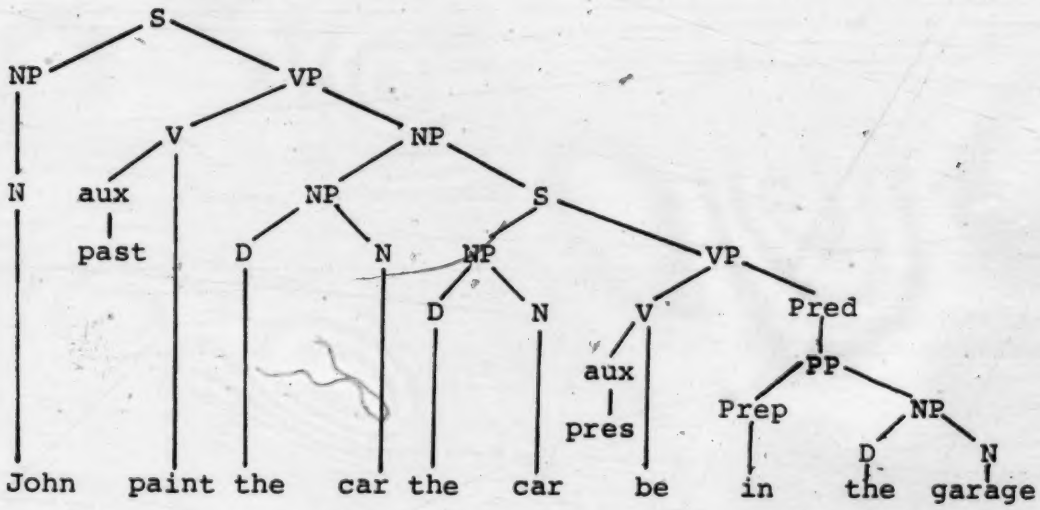


which of the possible underlying grouping structures was intended. The sentence could mean "John painted the car that is in the garage: (as opposed to the car in the driveway), or it could mean "John went out to the garage and painted the car" (as opposed to painting it on the street). In the first case the phrase "in the garage" would function as an adjective phrase modifying the noun "car." In the second possible grouping, the phrase functions

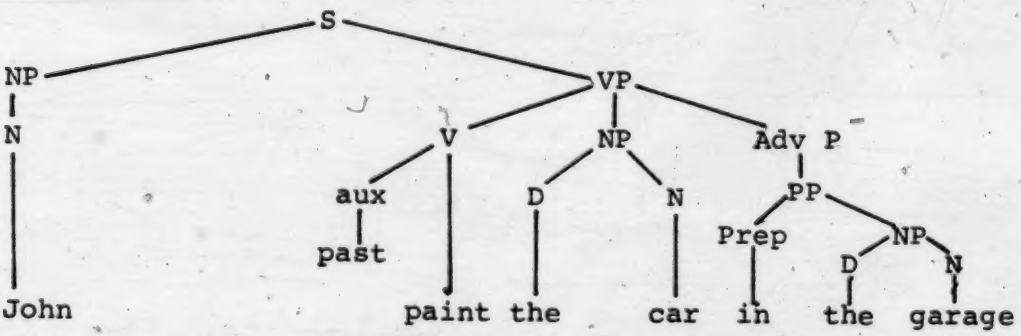
Figure 2.7: Structural Ambiguity

John painted the car in the garage.#

Deep Structure No. 1



Deep Structure No. 2



as an adverb modifying the verb "painted". The two varying interpretations of the sentence are indicated by having two possible deep structures for the one sentence.

This brief summary demonstrates the main concepts of transformational grammar. It shows the methods used to diagram these concepts and describes some of the benefits

of the model to the task of language description. In the forthcoming chapters, the organization of music will be explored to determine whether similar concepts function in music. In particular, the concept of a deep structure level of syntax which determines semantic interpretation will be examined for its possible function in music structure. Where deemed applicable and useful, certain linguistic methods of structural description such as tree diagrams will be used to describe some aspects of musical organization.

NOTES

[1]Chomsky, Aspects of the Theory, p. 112.

[2]Ibid., p. 122.

[3]Ibid., p. 84.

[4]After Andreas Koutsoudas, Writing Transformational Grammar: An Introduction (New York: McGraw-Hill, 1966), p. 14.

[5]Ibid. p. 17.

[6]Ibid. p. 15.

[7]Chomsky, Aspects of the Theory, pp. 88-89.

[8]Chomsky, Syntactic Structures, p. 75.

[9]Ibid. p.64.

[10]Ibid., p. 81.

[11]Borstein, Transformational Grammar, p.97.

[12]After Koutsoudas, op.cit., pp. 29-35.

[13]Ruwet, Generative Grammar, p. 236.

[14]Borstein, op. cit., pp. 36-37.

[15]Ibid., p. 36.

CHAPTER THREE: DEEP STRUCTURE AND MUSICAL MEANING

Chomsky's deep structure can be defined as the syntactic structure necessary for the semantic interpretation of a sentence. Therefore, before one can attempt to describe a deep structure of music, one must first define precisely what constitutes the semantic level in music. In other words, what is meant by the "meaning" of music?

"Musical studies for better or worse, tend to resolve all questions of meaning into problems of formal structure or of historical and social context."[1] Music cannot be defined precisely in a manner similar to language. Although words derive some of their meaning from context, they also have a referential content outside of their specific usage in a sentence. A melodic motive does not have a referential meaning outside of its use in a composition (with the exception of musical quotations). The meaning of a motive is derived from context and it changes as it is used throughout a composition, although the possibilities for its use are determined to an extent by the nature of the harmonic and melodic material involved. It follows that the meaning a motive would have in one composition would be totally different from the meaning it had in another composition.

Although there have been times in music history when a particular musical idea was associated with a specific semantic notion (such as the meaning attributed to the Greek modes), and certainly different styles of music invoke a variety of semantic connotations; there is no evidence to establish a direct link between specific musical configurations and concrete objects or precise emotional effects. Referring to his experiments testing subjects' semantic response to a variety of musical excerpts, Michel Imberty has said, "There is some semblance of a musical code established but there is no correlation at the word to note, word to chord, word to rhythmic figure or word to melodic unit level."[2]

Music, then, does not have the direct signifying content of language, but there is another type of meaning present in both cases. William Bright has defined the two different types of meaning as exolinguistic and endolinguistic content. Exolinguistic content is that which the sentence derives from outside of language to things it refers to. Endolinguistic content is that derived from the linguistic structure of the sentence itself, from phonological and grammatical relationships between its parts. For example, in the sentence "The boy hit the ball.", lexical information which defines "boy" as a human, male, young, and so on is exosemantic; while information which defines its grammatical features such as noun, subject of a simple

sentence is endosemantic. The primary content of musical meaning is endosemantic.[3] Meaning in a musical work is derived from the relations found among its elements. The organization of rhythmic and metric patterns, the thematic development of motives and the underlying harmonic relations of a work are some of the familiar ways through which meaning is derived in tonal music.

Endosemantic or structural meaning is not the only type of meaning found in music but most other types are predicated upon an understanding of the structural meaning of the music. Music is similar to language in this aspect. Nicholas Ruwet elaborates on this point while describing the function of the semantic component of transformational grammar.

> The work of the semantic component consists of constructing the meaning of a sentence from the meanings. . . . In fact the successive amalgams are completely determined by the phrase structure of the sentence (or rather the underlying terminal strings), and for example two elements that are not constituents of the same higher unit cannot have their meanings amalgamated.[4]

In music, a theme may have certain semantic connotations associated with it, for example "idee fixe" from Berlioz' Symphonie Fantastique, but the perception of that theme as a musical unit is based upon the understanding of the factors that determine the grouping of its constituent notes.

A further example of the dependence of semantics on structural function involves concepts such as actor and reactor in a sentence. Allan Keiler says, ". . . relational

example, the phoneme sequence (eneym) can be analysed in more than one way on the morphological level : "an aim" and "a name."[7] Another example would be the two sentences "John played tennis." and "My friend likes music."[8] The examples are distinct on the phonological and morphological levels. However, on the level of phrase structure they are both represented as NP - V - NP (noun phrase, verb, noun phrase). Chomsky cites such examples as motivation for establishing independent levels of structure.

Constructional homonymity operates in music as well as in language because the structure of both involves not only the order of elements but the manner in which those elements group and combine with one another. The smallest discrete element operating in music structure is the note, and a level of structure similar to that involving the phoneme could be postulated. Such a level would deal with the auditory phenomena of music such as the frequency of pitches, the wave forms of the sounds involved, the overtone series and similar matters. Otto Laske has examined the makeup of such a level, which he calls the sonological.[9] More directly involved with describing syntactical matters is the morphological level, which involves the rules for the combination of phonemes to form the smallest meaningful units. In music, a possible correlation for this level would be one involving the ways notes combine to form motives and intervals.

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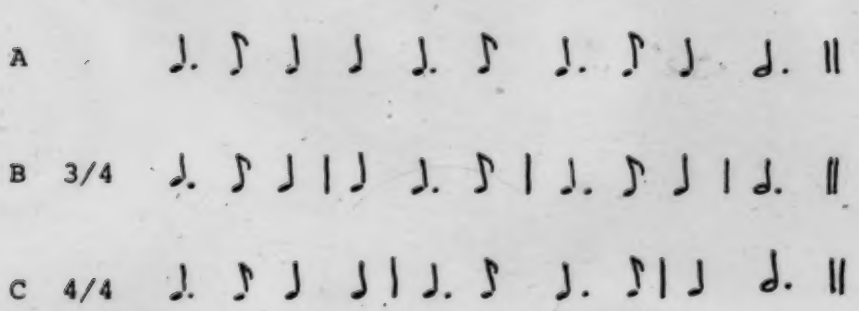
The third level of structure in language involves the way words group together to form grammatical categories. Music involves two basic parameters: pitch and rhythm. Because both pitch and duration are syntactically organized, this level of music structure would involve the grouping of pitches into harmonic categories (chords and chord functions), and the grouping of durations into metrical categories (beats and measures).

Musical levels such as those mentioned above demonstrate the variety of types of syntactical organization operating within a musical work and provide examples of constructional homonymity found in music. Figure 3.1 shows two rhythmic patterns, one in 3/4 time (Rhythm B) and one in 4/4 time (Rhythm C).

Figure 3.1: Constructional Homonymity



On the level of durations, both rhythms share the same pattern as shown in Figure 3.1 A. However, on the metric level, because of the different grouping of beats into measures,

the two rhythms involve different patterns of accentuation.

Where does the concept of deep structure fit into the structural levels previously mentioned? Not all the syntactical organization involved in the understanding of a musical utterance is apparent on the surface of the music. It may be camouflaged by surface characteristics of a piece, or it may be solely a cognitive concept which listeners attribute to the music in their attempts to organize and understand the sounds involved. Jackendoff and Lerdahl elaborate on this point. "Analytical terms such as 'downbeat,''elaboration,' 'prolongation,' 'structural dominant,' and 'cadence' are simply not applicable to the stimulus object per se : they are characteristics 'attributed' to it as part of the process of musical perception."[10]

The idea of some type of structure underlying the musical surface is not new to music analysis. Theorists from a variety of methodological backgrounds have made reference to it.

> The sound may be viewed as an iconic sign because what it is valued for is not "in" it but, as it were "behind" it. The qualities we experience as the sound's meaning are not confined to its acoustical properties and their modalities go far beyond the auditory. 11

> Background equates with "the most basic level of structure." A background of regular phrase lengths is essentially a stylistic norm, and the foreground is a deviation from it. Foreground / background concept causes tension between what occurs and what is expected and what occurs and what is implied. 12

Of course, the most well known proponent of an underlying or background structure is Schenker.

> A composition represents itself to the observer as foreground. This foreground is so to speak, only its "present" (Gegenwart), taking the dictionary sense of the word. We know how difficult it is to grasp the meaning of the present if we are not aware of the temporal background. It is equally difficult for the student or performer to grasp the "present" of a composition if he does not include at the same time a knowledge of the background. 13

Assuming, then, that there is a level of structure underlying the surface of a piece of music, what is the benefit of isolating and identifying that level of structure? In particular, what is the advantage of the transformational model? The deep structure in Chomsky's model is an abstraction containing grammatical relationships which may not be present in the surface structure of the sentence and not all the structure that is contained on the surface. Transformations demonstrate the recursive power of the language, showing how the basic processes of sentence structure can be elaborated forming relationships on the musical surface that appear significantly different than those found in the deep structure. Transformations can be seen in this light to be a source of creativity, allowing a writer more freedom of expression while still maintaining the grammatical relations necessary to basic sentence structure.

As mentioned in Chapter Two, the study of deep structure and transformations can bring forth evidence of similar-

ity between two sentences whose surface structures seem radically different. A classic example given was that of active and passive sentences. It was only from the perspective of transformational grammar that an explicit explanation of the similarity between the two sentences, which the native speaker had intuitively apprehended, was made possible.

These same ideas can be seen to function when the concepts are applied to music analysis.

> The similarities of two pieces of music may not be observable surface phenomena but rather the underlying relationships of the notes they employ. The only way in which these relationships can be expressed is by abstracting them away from the music and representing them directly. No constituent analysis can do that. 14

A simple example would be to consider a serial composition. If a listener were not aware that the piece used the twelve-tone system and simply compared the two passages, one using the retrograde and the other the inverted form of the row, it might be difficult for him to find any relationship between them (setting aside at this point, the matter of possible similarities between parameters other than pitch). It is only with a knowledge of the transformational operations of inversion and retrograde, that the relation between the two passages becomes clear.

The transformational model can demonstrate the recursive power of music with respect to areas such as harmonic function. For example, it could be shown how a two-

measure phrase based on the harmonic progression I - V - I could be expanded by the process of embedding to form an eight- or sixteen-measure phrase which on the surface might be seen as extremely complex. Thus, creativity in music could also be postulated as stemming, in part, from the use of transformations to elaborate basic musical processes.

Another advantage which the use of a deep structure concept in analysis would bring to music is the clarification of the role of meter in musical structure. Meter is largely a cognitive concept because its presence is understood both when it is overtly present in the surface of a piece, such as in the continuous oom-pah-pah of a Strauss waltz, and when it is almost totally obscured in more complex, highly syncopated music. Whether present on the surface or on a deep structure level, the abstract concept of a meter underlying the rhythms of the musical surface influences the perception and mental organization of those rhythms and helps determine their structural meaning. Maury Yeston describes it thus:

> In addition, the theorists of the last three hundred years have universally understood meter to be a conceptual source of accent interpretation, a context of regularly recurring structural accents and weak beats with which, or against which, freer rhythmic designs may play. 15

The use of a deep structure concept can make explicit the grammatical relations involved in musical

concepts such as syncopation. Syncopation derives its structural meaning from the tension between the surface rhythm and the underlying meter. In Figure 3.2 A, because there is no indication as to the underlying metric structure, the stress would naturally fall on the quarter note because it has a longer duration than the surrounding notes.

Figure 3.2: Metric Deep Structure and Syncopation

In Figure 3.2 B, the underlying metric structure indicates an accent be placed on the quarter note and so the metric accent and the surface stress would coincide. In Figure 3.2 C, the metric structure indicates an accent on the first eighth note while the surface stress remains on the quarter note. The tension between the placement of metric accent and the surface stress pattern causes the syncopation. The syncopation exists even when the metric accent is purely cognitive, as in this example where there is not correlation from other voices or other musical parameters to confirm the metric accent.

Examples such as those mentioned briefly above offer compelling reasons why an exploration of musical deep structure could be helpful in music analysis. However, the question may remain as to whether the processes which govern our understanding of language are the same ones used

for the understanding of music. It is certain that music perception involves a degree of competence, defined as internalized mental phenomena which listeners use to organize musical structure into coherent patterns.

H. Lowery comments upon this fact while discussing abstract structure.

> Clearly, such a presentation of abstract ideas is only possible because of the entire dependence of music upon the action of the mind. The materials of music are themselves mental phenomena having no existence whatsoever apart from a perceiving mind, and their manifold musical relations are again the result of further mental activity. 16

Research in other areas of music has confirmed the presence of some form of musical competence. When outlining the development of musical learning in children, Marilyn Zimmerman describes the process as proceeding from simple perception to the acquisition of cognitive concepts that enable the child to understand the music, in other words the development of a musical competence.

> Conceptual development in musical learning is dependent upon aural perception, since musical learning begins with the perception of sound. From our various perceptions of music, we develop the musical concepts that permit us to make comparisons and discriminations, to organize sounds, to generalize and finally to apply the emerging concepts to new musical situations. 17

A possible reason that humans employ similar mental processes for the cognition of both music and language may lie in the makeup of the human brain. Juan Roederer has speculated about the kind of connection between music and language processing.

> Music, as a matter of fact, seems to be a quite natural byproduct of the evolution of speech and language. In this evolution . . . a neural network emerged, capable of executing the ultracomplex sound processing, identification, and storage and retrieval operations necessary for phonetic recognition, voice identification, and comprehension of words and sentences. In the course of this evolution astounding redundancies, safeguards and back-up systems were built in, with the end result that language is only being processed in one cerebral hemisphere (for most individuals, the left side), leaving the almost identical auditory, neural network of the other hemisphere free "to do what it pleases" with the incoming information. And very likely, this is how the processing of music comes about. 18

Such ideas, which show the similarities between the organization of music and language structure, grant validity to the use of a method of language description, such as transformational grammar, as a basis for the exploration of music.

NOTES

[1]David Lidov, "Musical and Verbal Semantics," Semiotica, 31 (1980): 369.

[2]Michel Imberty, Signification and Meaning in Music (Montreal: University of Montreal Press, 1976), p. 7.

[3]William Bright, "Language and Music: Areas for Cooperation," Ethnomusicology, 8 (1963): 28-29.

[4]Ruwet, Generative Grammar, pp. 285-286.

[5]Allan R. Keiler, "Bernstein's The Unanswered Question and the Problem of Musical Competence," The Musical Quarterly, 64 (1978): 202.

[6]Chomsky, Syntactic Structures, pp. 86-87.

[7]Ibid.

[8]Ibid.

[9]See Otto Laske, "In Search of a Generative Grammar of Music," Perspectives of New Music, 12 (1974): 351-378.

[10]Jackendoff and Lerdahl, "Discovery Procedures," p. 506.

[11]Henry Orlov, "Towards a Semiotics of Music," in The Sign in Music and Literature, edited by Wendy Steiner (Austin: University of Texas Press, 1981), p. 135.

[12]Roger A. Deeson, "Background and Model: A Concept in Musical Analysis," The Music Review, 32 (1971): 349.

[13]Heinrich Schenker, "Organic Structure in Sonata Form," translated by Orin Grossman, Journal of Music Theory, 12 (1968): 178-180.

[14]Robin Cooper, "Abstract Structure and the Indian Raga System," Ethnomusicology, 21 (1977): 20.

[15]Maury Yeston, The Stratification of Musical Rhythm (New Haven: Yale University Press, 1970), p. 33.

[16]H. Lowery, The Background of Music (London: Hutchison's University Library, 1952), p. 21.

[17]Marilyn P. Zimmerman, Musical Characteristics of Children (Washington: Music Educators National Conference, 1971), p. 12.

[18]Juan P. Roederer, Introduction to the Physics and Psychophysics of Music (London: The English Universities Press, 1973), p. 11.

CHAPTER FOUR : THE SYNTAX OF TONAL MUSIC

This paper will primarily be concerned with a description of the structure of tonal music because of the relative ease with which its internal organization can be uncovered and because its types of organization have become internalized by most listeners. The types of structural organization discussed will encompass the familiar categories of harmonic, metric and melodic structure. The ways in which a listener's unconscious organizational principles can be indicated in an analysis will be explored. Linguistic concepts, such as tree diagrams, will be used in some cases as an aid towards this end.

The first aspect of musical organization to be examined will be meter. It was stated in Chapter Three that meter functions as a source of accentuation, predicting patterns of strong and weak beats which give structural meaning to the surface rhythms of a musical work. Musical surface, as defined here would equate with Yeston's uninterpreted rhythmic structure.[1]

The surface of any piece of music contains a variety of events which indicate stress in the music. The attack point of a relatively long note, or the repetition of a pitch event would indicate an emphasis on that note. Other

events which influence the placement of stress would be a change in the manner of articulation, changes in texture or abrupt changes in dynamics, significant changes in register, and so forth. Lerdahl and Jackendoff call this type of stress phenomenal accent.[2]

Phenomenal accent acts as part of the musical surface and indicates the rhythmic flow of the music. Listeners perceive the surface stresses and attempt to organize them into a coherent pattern, where stress occurs at a regular duration. When a consistent pattern of rhythmic stress on a number of levels can be perceived, a metric pattern has been established.

Meter, then, can be tentatively defined as a pattern of rhythmic stresses which occur at specified points within a given span. (For tonal music, the metric patterns used employ stresses placed at equal durations from each other). However, not all rhythmic stresses are of the same structural weight; some stresses are more strongly accented than others. A pattern of strong and weak stresses, alternating in some manner, is also necessary to establish a metric pattern. In order for one rhythmic stress to be perceived as more strongly accented than another, there must be more than one level of rhythmic movement on the musical surface.[3] If a stress on one level of rhythmic movement also functions as a stress on another, larger level of rhythmic movement, that stress is felt to be more strongly accented. To state it more plainly,

if a beat at the quarter-note level of rhythmic movement also functions as a beat at the half-note level, that quarter note will be perceived as more strongly accented than the quarter notes on either side of it.

Looking at Example 1, we can see how the phenomenal accents of the musical surface clearly establish the meter.

Example 1. Haydn, Sonata in C Major, Hob. XVI:1, mm. 1-4.

There are a number of rhythmic levels in operation, ranging from the sixteenth-note level to the two-measure level, the eighth-note level and the quarter-note level. The quarter-note level is established by both the melodic line and by the repeated C's in the left hand which occur at intervals of a quarter note. The eighth-note level is established by the pitch movement between C and E in the bass. (The pattern of stresses signified by the repeated G's does not coincide with the placement of stress at the quarter-note level and would establish a cross accent to the prevailing metric structure, since the accent of the quarter-note level is

stronger, being confirmed in both voices.) The repetition of the melodic arpeggiation of m. 2 establishes the rhythmic movement at the full-measure level. The repetition of tonic harmony in m. 3 establishes a level of rhythmic movement every two measures. The half-note level is established beginning in m. 4, where the harmony changes after a half note and the melody moves at half-note durations as well. Thus the phenomenal accents establish the entire range of metric relations and accent patterns signified by common time.

Once a meter has been established, the listener bases his expectations upon a continuation of the pattern of weak and strong accents. The rhythm of the musical surface may either confirm or conflict with the metric deep structure by placing a phenomenal accent on those notes where it is expected or, alternatively, where it is not. When the phenomenal and metric accents regularly coincide, the music will have a high degree of rhythmic clarity. Where they conflict, there may be rhythmic tension from familiar devices such as hemiola or syncopation, or there may be simply rhythmic ambiguity.

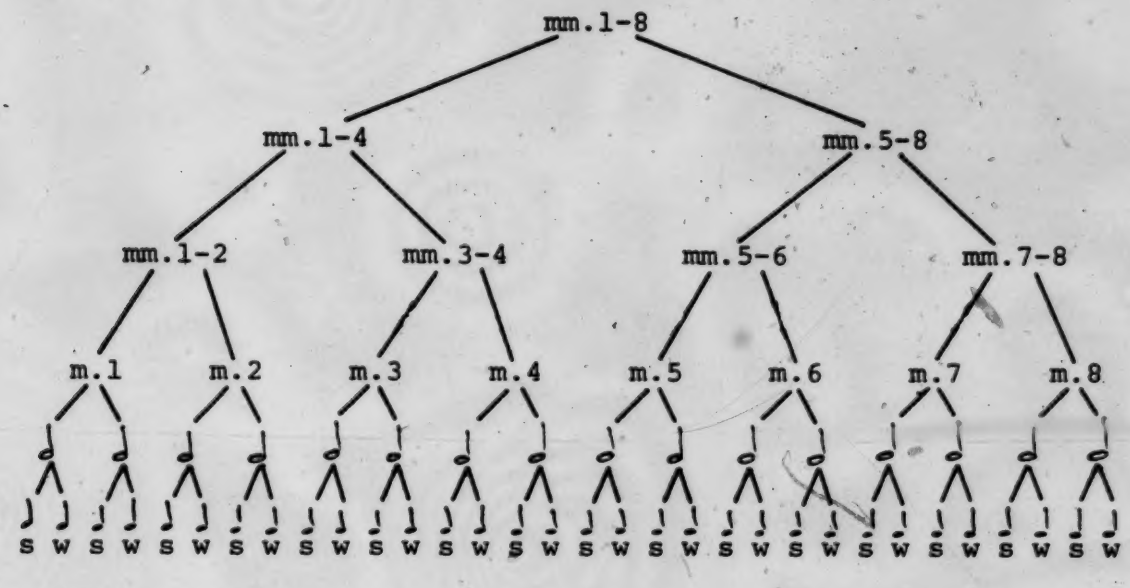
The metric patterns in use in most tonal music, have, by convention, established a system of relations for the placement of accent on each rhythmic level, which exists in the minds of listeners regardless of whether each rhythmic level has been established in the particular work in question. The relationship between levels involves a simple

ratio: beats on the next larger level are of a duration either two or three times that of beats of the preceding level. (Yeston calls such simple relationships between levels rhythmic consonance.)[4] The difference between simple and compound meter is that simple meter involves only relations multiplied by two, while compound meter has at least one level where the relationship is three times the duration of one of the other rhythmic levels.

Metric patterns also hold conventions for patterns of strong and weak accent beyond the single-measure level. These conventions result in listener expectations of phrase lengths built around symmetrical groupings of two, four, and eight-measure phrases. These phrase lengths result from the projection of the simple two-to-one durational relationship of rhythmic levels beyond the whole-note level. Such large-scale metric structures are referred to as hypermeasures by Edward Cone.[5] David Epstein confirms these points. "Hypermeasures also have conventionally determined strong - weak patterns. . . . The four-measure hypermeasure is a staple module of classical music."[6]

Figure 4.1 diagrams the syntactical relations found in a typical eight-measure phrase in common time from the largest level to the quarter-note pulse.

Figure 4.1: Metric Deep Structure of a Standard Phrase[7]



s-strong, w-weak.

The larger-scale groupings are found towards the top of the diagram where they can be seen to dominate the lower groupings. In each subbranching, the group on the left node receives the strong accent because it is also a beat at the next largest level.

It should now be clear that meter is an important part of the structural organization of music, both through its effect on the organization of musical rhythm and through its effect on the perception of musical phrases. Having stated that the deep structure will account for those syntactic structures which determine the meaning of an utterance, we must conclude that metric organization is a part of the deep structure of music.

David Epstein has commented upon the role of meter

in organizing the perception of the passage of time. The organization of the element of duration is something not found in the structure of language.

> The segmenting of time, in other words, is fixed, though the internal shaping of each segment might allow for somewhat varied approaches. . . . It is this quality, then, that is special about music among the temporal arts - the absolute structuring of experienced time, in its proportioning and in its unfolding. 8

One aspect of the temporal side of music which would not be considered part of the deep structure is tempo. Although the speed of a piece of music does influence the semantic connotations the music may invoke in a listener, it does not affect the syntactical composition of the piece itself. Therefore it would have no bearing on the structural meaning of the music (as defined in Chapter Three), and so it would not be part of the deep structure. Alfred Pike supports this point.

> For instance, the intrinsic relationships between tones are more stable than the subjective interpretation which appears as a property of their expression. If the music is played at a different tempo the listener may feel that its referential emotional content has changed, but the syntactical relationships will subsist as constant factors and to some extent can be grasped along with their purely musical, affective evocations. 9

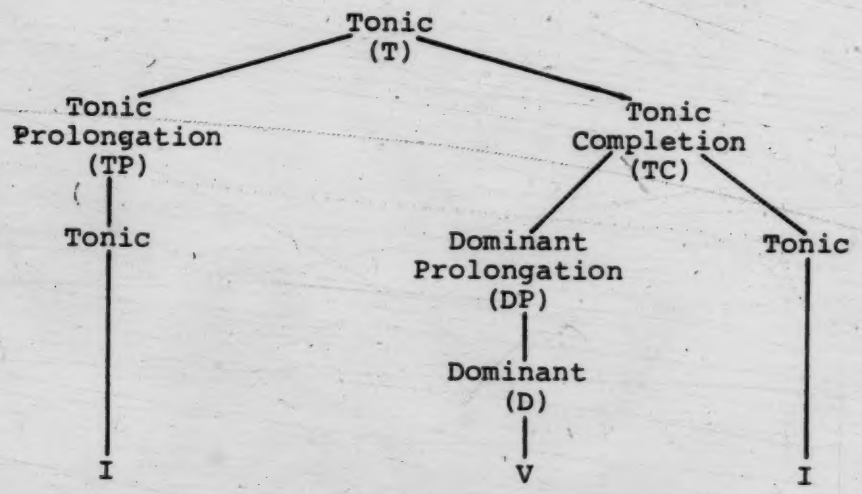
David Epstein has demonstrated that there are often specific relations between the tempi either within one movement or from one movement to another in large-scale works by Mozart (among others).[10] Where a continuous pulse is present within a larger work, its effect on the metric structure,

especially at the point of transition where the pattern of the previous section may overlap with the pattern of relationships in the new tempo, would have to be taken into account.

The second aspect of music which is syntactically organized and which constitutes part of the deep structure is tonality. The chords or harmonies which underlie a particular piece of music (or are implied by it in the case of an unaccompanied melody) can be grouped together to form grammatical categories or functions which are related to one another in specific ways. A simple C major triad has no structural meaning until placed in the context of a tonality. Only in context with each other can one determine the hierarchy of chord constituents which characterize the harmonic deep structure and determine structural meaning.

The basic chord functions of tonic, subdominant and dominant, and the ensuing heirarchy of chords which they involve, are well established for tonal music. Allan Keiler has proposed a basic formula for harmonic constituent structure, shown in Figure 4.2. In this model of harmonic constituent structure, chord symbols are for root position triads only.

Figure 4.2: Keiler's Harmonic Constituent Structure[11]

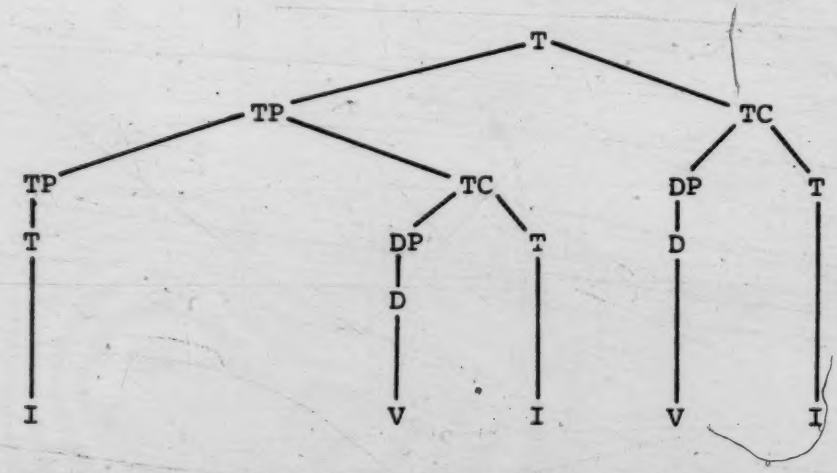


Keiler feels (and the present writer agrees), that the syntactical relations between categories of chord functions are independent of chord inversion. Chord inversion and chord spacing do not affect the assignment of structural functions (with the exception of the "six-four" chords), and thus would be part of the surface structure. (Second inversion triads are too unstable to be considered as functional harmonic areas and generally will be analysed in this paper as local prolongations or, for example, as part of the cadential preparations in the case of the tonic six-four chord.) Keiler states it as follows.

> This reasoning suggests that the chord functions of a piece form part of a hierarchical structure of constituents that can be analyzed and expressed in a formal way independently of the patterns of voice leading chosen and that this hierarchy is a more abstract or basic aspect of tonal harmony than structural (and surface) patterns of voice leading. 12

Keiler's tree diagram covers one basic aspect of harmonic constituent structure, the dominant-to-tonic cadence. Since harmonic structure is, of course, more complex, a means of expanding this basic structure is necessary to account for the more elaborate harmonic progressions found in music. Figure 4.3 diagrams the basic method of harmonic expansion.

Figure 4.3: Harmonic Expansion through Embedding[13]

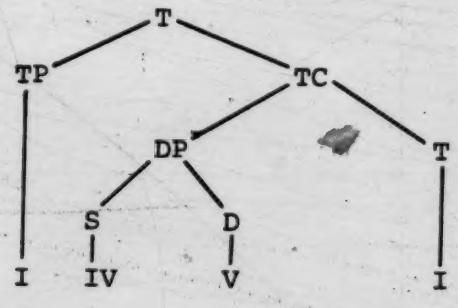


Keiler says of this diagram "This example suggests that the principle of syntactic embedding is a device of harmonic expansion just as it is a process of sentence expansion."[14]

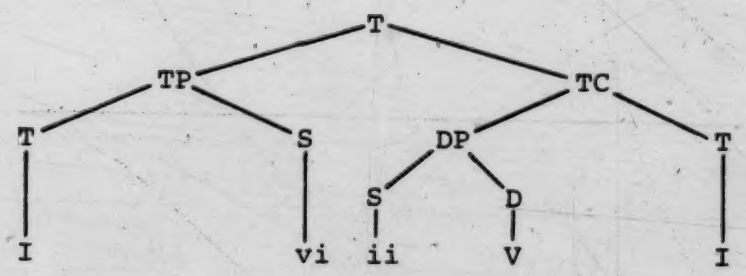
The functional category of the subdominant (introduced in a later article of Keiler's[15]) may function as part of either the tonic prolongation or the dominant prolongation. Figure 4.4 shows the harmonic constituent structure of a few basic harmonic progressions.

Figure 4.4: Constituent Structure of Some Basic Progressions

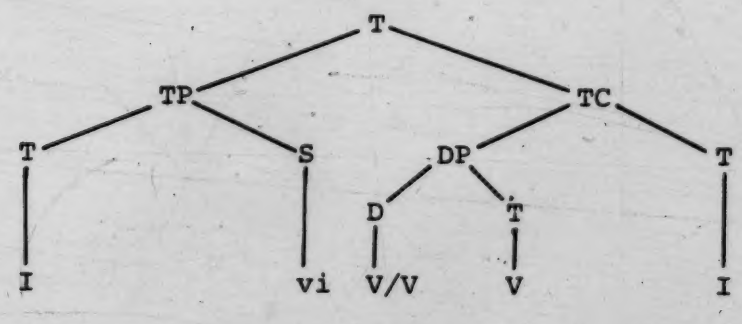
A : I - IV - V - I



B : I - vi - ii - V - I



C : I - vi - V/V - V - I



Chomsky has described several types of constituent constructions, among them left-branching and right-branching structures.[16] These are two different types of structure involving syntactic embedding. A sentence showing left-branching would be one such as "John's father's brother has red hair." The construct is left-branching because structures are added to the left of the subject. A sentence showing right-branching would be "This is the cat that ate the rat, that killed the bird." Structures are added to the right of the noun phrase: "the cat."

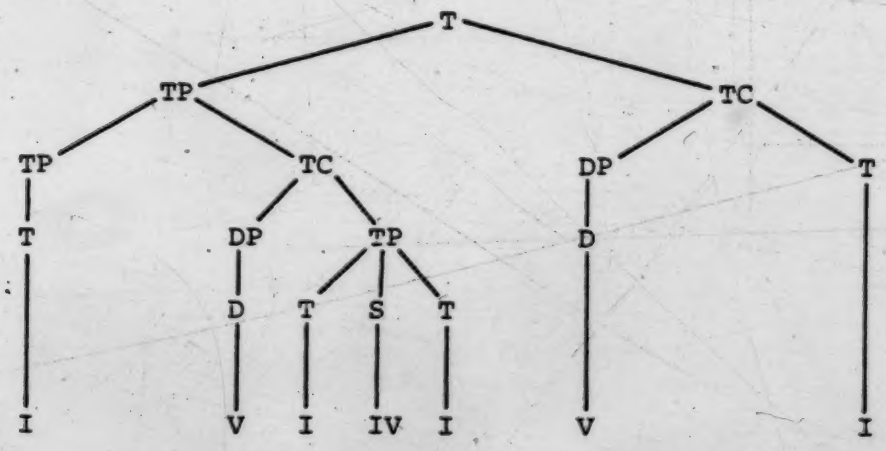
Both left and right-branching structures can be found in harmonic constituent structure. Left-branching constructs are the principal from of embedding used in describing the harmonic structure of phrases. The cadence appears as the structurally most important event at the right of the tree diagram. Other elements are embedded to the left of the cadence, prolonging either the initial tonic or some element of the cadence or the cadential preparation. A right-branching construct is found when the phrase is extended after the cadence, perhaps by a plagal movement or by another repetition of the cadential figure itself.

Figure 4.5 shows the constituent structure for Example 2. The cadence in measure four forms the highest-level tonic completion in the phrase. The subdominant movement in measure three prolongs the tonic chords which

surround it. The initial dominant-to-tonic movement functions as a lower-level movement embedded in the phrase, which ultimately only serves to prolong the initial tonic chord.

Example 2. Mozart, Sonata in C, K545. First Movement, mm. 1-4.

Figure 4.5: Harmonic Constituent Structure of Example II



The harmonic constituent structure is meant only to be an abstraction of the chord functions in a phrase and the syntactical relations between those functions. In this aspect it differs from simple chord labellings, in that it clearly demonstrates the relationships between chords, both those that are contiguous and those that are

separated on the musical surface. It does not take into account the effects of chord spacing or inversion or melodic movement within a harmonic area. These aspects of structure will be dealt with later in the chapter.

One aspect of harmonic structure not yet mentioned is that of modulation. There has often been disagreement among theorists as to what constitutes an actual modulation. Does the use of a secondary dominant establish a temporary modulation, or is it merely an elaborate prolongation of that chord or a projection of a syntactic pattern of dominant-to-tonic relationships (such as in a sequence)? Keiler feels that traditional harmonic analysis forces one to analyze as though a key has been temporarily "left" since the music cannot be in two keys at once. He says that the use of hierarchical levels indicates prolonging relationships and thus avoids the need for temporary modulations.[17] This does not apply for larger-scale modulations. Harmonic constituent analysis, based as it is on sentence structure, applies to the phrase or period level in music. However, when examining the overall harmonic movement in a musical work, one could construct a constituent diagram to show the relationship among the various tonal areas of the piece. This diagram could show how perhaps a modulation to the subdominant acts to prolong that functional area in a large-scale cadential movement over the length of the entire work.

Further aspects of harmonic structure, such as chords which serve two functions, can best be described through the use of transformations and will be discussed in Chapter Five.

Another aspect of musical organization which would function as part of a deep structure is grouping structure. Grouping structure is an abstraction from the music surface, segmenting that continuous surface into a variety of musical units. The various musical segments are related to one another in specific ways. For instance, a smaller group may form part of a larger one. That this is so makes grouping structure both hierarchical and recursive. Grouping structure plays a strong role in the perception of musical work; it is a necessary prerequisite to the perception of motive, theme or musical phrase.

Grouping boundaries are indicated by events on the musical surface. Slurs and rests are strong indications of grouping boundaries. Other indicators are changes in dynamics, texture, means of articulation, large changes in register, the interval of time between the attack points of notes, and so forth. For larger-scale grouping, factors such as parallelism and symmetry of grouping are important. These criteria for grouping are discussed by Lerdahl and Jackendoff as part of their preference rules.[18] Their notation of a series of slurs beneath the music, indicating the several levels of grouping, will be adopted in this paper.[19]

Example 3 shows the grouping structure for the

first eight measures of the opening piece of Schumann's Waldszenen.

Example 3. Schumann, Waldscenen, "Eintritt", mm. 1-8.

In m. 1, the slurring indicates grouping on the level of a whole measure. The eighth-note rest on the first and third beats divides the measure into two smaller groups. The parallelism between mm. 3-4 and mm. 7-8 establishes another level of grouping at the two-measure level. The ideal of symmetry, which causes a preference for dividing a segment into two groups of equal length,[20] would indicate a further grouping into two groups of four measures each. Of course in the context of the whole piece, the entire eight measures would constitute a group. The only anomaly in

this example occurs in mm. 5-6. The staccato quarter notes on the third and fourth beats of m. 5 and the first and second beats of m. 6 form a group which does not subdivide, so there is no grouping at the single-measure level for those measures. (The grouping structure in this example is based mainly on criteria for articulation. In conjunction with a harmonic analysis, changes might be necessary to accomodate the harmonic factor.)[21]

The grouping in Example 3 would generally conform to the divisions implied by the metric deep structure. The groups all begin on the beat, larger level groups begin on strong beats within the measure and the grouping conforms with the expected hypermeasure levels found in common time. Where such congruences occur, the grouping and meter are said to be in phase.[22] Grouping and meter will be out of phase when groups begin off the beat or when they begin on the weaker beats in a measure. Example 4, mm. 9-12 of the Schumann piece, shows grouping that is out of phase.

Example 4. Schumann, Waldszenen, "Eintritt", mm. 9-12.

The eighth notes tied to quarter notes which occur in the bass line result in groups that begin on the weak half of the beat. The tied notes in the upper voice, as well as the slurring in the bass, indicate groupings that begin on the weak half of the measure and extend across bar lines. Such grouping places a phenomenal accent on an unexpected beat and obscures to a certain extent the placement of the metric strong beat, causing a degree of rhythmic tension.

Grouping and meter are thus separate entities which may or may not be mutually reinforcing. Grouping structure deals with phenomenal accents which may coincide with metric accent if grouping and meter are in phase. Lerdahl and Jackendoff propose a third type of accent -- structural accent.[23] These accents occur at points of harmonic gravity in the music, such as cadences. Cadences often articulate grouping boundaries from the phrase level up but this is not a necessary prerequisite of grouping. Groups may extend beyond the cadential movement or they may begin on an upbeat to the point of initial harmonic gravity in the phrase. In instances such as these, the phenomenal accent associated with a group boundary would not coincide with the structural accent. Metric accent and structural accent also may or may not coincide. The familiar classifications of masculine and feminine cadences are based upon the distinction between a cadence in which metric and structural accent coincide and one in which they do not. Only a

separation of grouping, meter and structural accent can account for such differences which listeners intuitively perceive in music.

Grouping structure, as described up to this point, involves exhaustive segmentation of a musical surface with every event belonging to one group and only that group (and the larger groups which subsume it). Exceptions to this rule, in the form of overlaps and other grouping irregularities, will be discussed in the next chapter on transformations.

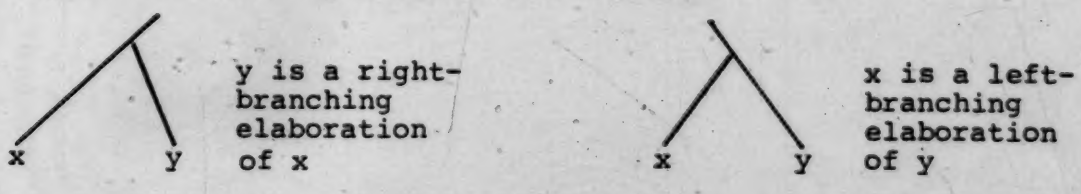
So far, three aspects have been mentioned as integral to describing the structural meaning of music: meter, harmonic structure and grouping structure. One further area remains to be discussed: melodic structure. Harmonic constituent structure accounts for some of a listener's intuitions about pitch but not for all of them. The harmonic structure applies to abstract tonal areas and the relations between them. The listener perceives the music as either prolonging one area or progressing towards another. Harmonic structure does not detail voice leading relations or the relation between pitch structure and rhythmic placement.

The analysis of pitch structure is based on the hypothesis that the listener attempts to organize the pitch events of a piece into a coherent structure where they are heard in a hierarchy.[24] Through this hierarchy, certain pitch events are heard as being more stable while other

events are heard as elaborations based on such criteria as metric placement, rhythmic duration, register, attack and so forth. An analysis of this type enables one to account for the way in which a listener perceives an abstract harmonic area in a series of pitch events, how a listener perceives melodic movement in the various voice lines which may be active on a musical surface, the role of chord inversions in a hierarchy of pitch structure, and the influence of grouping and meter on pitch stability.

Lerdahl and Jackendoff have outlined a method for pitch analysis called time-span reduction.[25] In this method, a musical surface is segmented into a hierarchy of units based on its metric and grouping structures. For each time span thus established, one event is chosen as the most important pitch event and is designated as the "head" of that time span.[26] On the succeeding hierarchical levels, the heads are chosen from the heads of the time-spans that constitute the larger unit. The relationship between heads and their surrounding pitches is represented by a variation of tree-structure notation. Figure 4.6 shows the notation for left- and right-branching elaborations.[27]

Figure 4.6: Time-span Reduction Notation



The time-spans are established by the metric structure at the smallest levels. At progressively larger levels, the grouping structure becomes more important. Where grouping and meter are out of phase, beats will be added to the time-span to include those changes, creating an augmented time-span.[28] Where a group begins on a weak beat, that upbeat will be joined with the following time-span to form an augmented time-span. Each time-span level will form a distinct hierarchical level in the reduction tree.

A single pitch event will normally be chosen as the head of the time-span. (This does not necessarily mean a single pitch. The pitch reduction does not function only on a single melodic line but on all voices; thus the heads chosen will often be chords.) There is an exception where two chords may be retained from a single time-span at succeeding hierarchical levels. Both members of a cadence must be retained even when they occur within the same time-span.[29] One further exception, in cases where a rhythmic figure encompasses more than one line with melodic movement (such as an Alberti bass), all pitches constituting a melodic line will be retained beyond their initial time span. Such cases are called fusions[30] and are marked by special notation in the reduction tree. (Example 5 will involve fusion of an Alberti bass.)

There are a variety of rules which Lerdahl and

Jackendoff propose for the selection of time-span heads.[31] A head is generally the most stable event in a time-span. The commonly accepted rules for consonance and dissonance apply. Inversions of chords are less stable than root position triads, chords which are more closely related to the tonic are more stable, and so forth. In choosing the head of a time-span, one that occurs in a relatively strong metrical position is preferred. A low or high point in the melodic movement may also be preferred as head although it should be reaffirmed in other parameters for it to be felt clearly. When the motivic or rhythmic outlines of two time-spans are similar, parallel heads are the most common occurrence. The listener is most likely to hear as the most stable event that which results in the most stable linear and harmonic connections. As mentioned above, the cadence is always retained as head, though at larger levels the cadence of a four-measure antecedent might be subordinate to the structural beginning of the phrase since that head would also function as the beginning of the whole eight-measure period. Example 5 shows the time-span reduction for the first four measures of the Mozart sonata for which the harmonic constituent structure was diagrammed in Figure 4.5.

Example 5. Mozart, Sonata in C, K545, First Movement, mm. 1-4: Time-span Reduction.

In Example 5, the structural beginning is notated as being more stable since in the light of an analysis of the whole movement, it would also function as the structural beginning of the first twelve measures. The analysis functions from the eighth-note level to simplify things since there is no significant movement on the sixteenth-note level.

The vertical crossbars indicate fusion.

There are a number of aspects of the pitch structure which can be seen from the diagram. At the whole-note level, the most stable structure is consistently placed on the weaker portion of the measure, while at the half-note level the stable structure occurs on the strong quarter-note. The head of every measure is the tonic triad, which is why the harmonic constituent structure indicated that the tonic was prolonged throughout the phrase until the cadence. In each appearance of the tonic triad, the head occurs in a metrically strong position. C, which is the most stable pitch in the bass, occurs on the strong beat at the half-note level, while the E, which is the more stable of the two remaining members of the triad, occurs in strong position at the quarter-note level. In contrast, the dominant chord in m. 2 and the subdominant in m. 3 are in the highly unstable six-four inversion at the half-note level. The dominant never occurs with the root in strong metric position in the bass.

The motivic parallelism of the first and third measures is reflected in the assignment of heads. In m. 1, though the G is the highest note it is less stable than the preceding E and is in a weak metrical position so it is not selected as the head. In m. 3, the C on the last quarter note is more stable than the G and is the highest note in the phrase. However, because of the weak metrical

position and the parallel with the first measure, G was selected as the head and this showed more clearly the neighbour note motion of the subdominant which is indicated clearly in the bass. The time-span reduction explicitly shows simple relations, such as those mentioned above, which are necessary to a complete understanding of structural meaning.

Melodic structure entails a further level of meaning aside from pitch relationships arising from its own internal patterning. Motives and themes and their distribution throughout a work add another level of structural meaning. The recognition of a motive or its transformation allows for the perception of structural parallelism which is an important input to other areas of the deep structure. Both grouping structure and time-span reduction are influenced by the perception of motivic parallelism.

The basic principle governing melodic structure is that of repetition. A composition establishes a variety of paradigmatic units, including that which is commonly called a motive. A code of equivalences, which gives structural meaning to the melodic structure through the perception of parallelism, is established between these units and their transformations. David Osmond-Smith describes the nature of this type of structural meaning:

> The type of analysis so far examined has been based on the supposition that repetition constitutes the basis of musical significance. Consequently if a

> formal element can be demonstrated to refer to some pre-existing element (whether common to the musical practise of the time or peculiar to the work in question) it will communicate, and if not, it will not. 32

Higher-level constructs, such as themes, evolve from the combination of one or more lower level paradigmatic units. A theme imposes a certain syntactic ordering on its constituent elements and that ordering is one of its properties. Osmond-Smith says, "But it will be evident that each time that a higher level paradigmatic unit (e.g. a theme) is established within an individual work, it will impose a syntactic ordering upon the smaller elements that make it up." 33

How is a paradigmatic unit determined? Observation of the internal repetitions in a musical work establishes the units, and further examination of them under transformation determines their final shape. For example, if under transformation a motive was found to split into two sections, it would have to be classified as two separate motives with the original one under study being considered a higher-level unit combining the two.

A paradigmatic unit contains a number of features, and its transformations involve the conservation of one or more of the unit's pertinent features, while permitting changes in the others. This criterion for equivalence establishes a code which David Lidov has described as " . . . A simple pairing of items from different categories. Repetition creates internal musical codes. Two unlike items in one category are brought into relation when they are coded by like

items in another category." [34] The establishment of a code allows a listener to group and classify the motivic ideas in a musical work and to perceive some type of pattern.

Motivic parallelism most frequently involves the perception of surface patterns of rhythm and pitch movement. Transformations involve the conservation of the surface pattern of one parameter, such as pitch, while altering another parameter such as rhythm. However, parallelism may be based on the conservation of pitch relationships on some reductional level while the musical surface is altered through melodic embellishment or some other means. (The relationship of surface melody to a constant abstract reductional level of pitch relations accounts for the understanding of the motivic relationship of a set of variations.)

Thus, motivic parallelism involves perception of both surface patterns and deep structure levels of pitch reduction and sometimes meter. Motivic parallelism is not an independent source of structural meaning. It is not hierarchically organized. It functions instead as an adjunct to the perception of grouping and pitch structure.

There are other aspects of musical structure which, though they are not independently organized, function as input to the hierarchically organized aspects of musical deep structure. A good example is dynamics. For tonal music, the listener may perceive levels of dynamic movement but these are not related to each other to form an independent hierarchy

of dynamic levels. Instead, dynamics may function as indicators of grouping and metric structure. Sudden shifts in dynamic levels can indicate grouping boundaries, while surface accents may be important indicators of the position of metric strong accent. Whether dynamics reflect or contradict the underlying metric structure, in all cases they function as part of the structure of grouping and meter and not as an independent system of hierarchical levels of volume.

A more ambiguous case is that of timbre. Changes in timbre or texture form strong perceptions of grouping boundaries and thus the placement of phenomenal accent. In such instances timbre would function as input to grouping or metric structure. Timbre can also be an important way of distinguishing various concurrent levels of rhythmic motion in a musical passage.[35] When each rhythmic level of motion is carried by a different line with a different timbre, it is easier to perceive the individual motions. As such, timbre would again be functioning as part of the metric structure.

Timbre most certainly is an important aspect of the affective character of music. Various instruments or instrumental effects, such as a drum roll or a trumpet call, have certain extra-musical connotations stemming from associations outside of the music itself. However, these associations would be purely exolinguistic. As stated earlier, the deep structure will be based only on those factors contributing to endolinguistic or structural meaning.

Timbre can, in some instances, contribute to structural meaning independently of other parameters. There are many cases where the development of a musical idea is accomplished through the use of changes in timbre. For example, the first presentations of the theme from the fourth movement of Beethoven's Ninth Symphony employ a variety of orchestral timbres concluding with a full orchestral presentation. The harmonic, melodic and rhythmic material remains stable in this passage. The perception of development and the structural meaning of the passage is dependent upon the building hierarchy of timbres. Even in such cases though, timbre is not as structurally significant as pitch or rhythmic structure in the overall perception of a piece. It is not until the twentieth century, really, that examples can be found where the perception of a hierarchy of timbre is more fundamantal than the perception of pitch or rhythmic structure.

In summary, four areas of organization have been discussed which would function in all cases as part of a deep structure of music. They are metric structure, grouping structure, harmonic constituent structure and pitch reduction. Each of the aspects involved segments the musical surface into a variety of units. Since the structure which determines this segmentation is not necessarily apparent on the musical surface, there may often be ambiguity as to which is the applicable segmentation.

In language structure, there is a comparable sort of ambiguity. Sentences such as "Visiting relatives can be boring," or "Flying planes can be dangerous," are unclear, at the surface level, as to their constituent structure and consequently their semantic interpretation. For instance, the phrase "the shooting of the hunters," could mean "the hunters shot something" or "someone shot the hunters."[36] Chomsky feels this type of ambiguity arises when a phrase or sentence can be derived from two possible deep structures.

Since in music there is always more than one possible segmentation (arising from the various aspects of the deep structure), musical phrases have a level of ambiguity built into them. Composers may use the multiplicity of possible segmentations to create a controlled form of ambiguity for expressive purposes. The ambiguity creates tension, the resolution of which may be effected or delayed as the composer wishes.

NOTES

[1]Yeston, Stratification, pp. 35-36.

[2]Fred Lerdahl and Ray Jackendoff, A Generative Theory of Tonal Music (Cambridge: MIT Press, 1983), p. 17.

[3]Both Lerdahl and Jackendoff, Generative Theory, p. 19 and Yeston, op. cit., p. 67, agree that there must be two or more levels of rhythmic movement to establish a meter.

[4]Yeston, op. cit., p. 78.

[5]Edward T. Cone, Musical Form and Musical Performance (New York: W.W. Norton and Company, 1968), p. 40.

[6]David Epstein, Beyond Orpheus: Studies in Musical Structure (Cambridge: MIT Press, 1979), p. 62.

[7]Based on the description of a "perfect phrase" in David Lidov, On Musical Phrase (Montreal: University of Montreal Press, 1975), p. 16.

[8]Epstein, op. cit., p. 56.

[9]Alfred Pike, A Phenomenological Analysis of Musical Experience and other related essays (New York: St. John's University Press, 1970), p. 11.

[10]Epstein, op. cit., pp. 75-95.

[11]Keiler, "Bernstein's The Unanswered Question," p. 214.

[12]Allan R. Keiler, "The Syntax of Prolongation," In Theory Only, 3 (1977): 14.

[13]Keiler, "Bernstein's The Unanswered Question," p. 215.

[14]Ibid.

[15]Allan R. Keiler, "Music as Metalanguage: Rameau's Fundamental Bass," Music Theory: Special Topics, edited by Richard Browne (New York: Academic Press, 1981), p. 95.

[16]Chomsky, Aspects of the Theory, pp. 12-13.

[17]Keiler, "Two Views," pp. 156-158.

[18]Lerdahl and Jackendoff, Generative Theory, pp. 43-55.

[19]Ibid., p. 13.

[20]Ibid., p. 49.

[21]Ibid., p. 52.

[22]Ibid., p. 30.

[23]Ibid., p. 30.

[24]Ibid., p. 106.

[25]Ibid., pp. 124-178.

[26]Ibid., p. 120.

[27]Ibid., p. 113.

[28]Ibid., p. 127.

[29]Ibid., pp. 156-158.

[30]Ibid., p. 153.

[31]Ibid., pp. 159-170.

[32]David Osmond-Smith, "Problems of Terminology and Method in the Semiotics of Music," Semiotica, 15 (1975): 291.

[33]Ibid., pp. 273-274.

[34]Lidov, On Musical Phrase, p. 59.

[35]Yeston, Stratification, p. 41.

[36]Cooper, "Abstract Structure," p. 4.

CHAPTER FIVE : TRANSFORMATIONS

The second part of the syntactical component of Chomsky's grammar is the transformational component. As described in Chapter Two, transformations change the syntactical relationships present on the deep structure level into a new derived set of relationships on the surface structure level. Surface structure is not equivalent to the actual music but is, rather, still an abstraction of the relationships present on the musical surface.

The same concepts which underlie linguistic transformation also operate in music. Transformations can show how the simple phrase structure or metric and harmonic syntax of the deep structure can be traced through transformational operations to become the more complex set of relationships found in the surface of the music. It may then be shown how two musical phrases which appear radically different may have significant parallels on the deep structure level.

Transformational operations are not always a means of constructing an elaboration of a more basic underlying level. Transformations may obscure the simple relationships which make up a phrase. One means of accomplishing such a task is the use of the deletion operation. A transformation may delete structure so that a relationship

which is explicit at the deep structure level is only implicit on the surface structure level. For example, in a harmonic progression, a pivot chord may serve two functions. These relationships would be explicit on the deep structure level, where the chord would be represented twice, once for each function. On the surface level, only one chord will appear and its double function will only be implied, not explicitly demonstrated.

Allan Keiler describes the relationship of deep structure to surface when transformations are used in the two different ways.

> It will always be the case, therefore, that instances in both domains (language as well as music), can always be considered derived or transformed from more basic and prototypical (or less complex or elaborated) instances. This relation is particularly true of certain syntactical aspects of sentence structure and of harmonic prolongation. Another property that both share is derivational operations, which create surface forms that are related in irregular, elliptical, or otherwise transformed ways to more general underlying forms. In the case of the former, metalinguistic statements will tend to be reductions (i.e., will have the form of reductions); in the latter, they will tend to have the property of paraphrase (i.e., they will be more explicit). 1

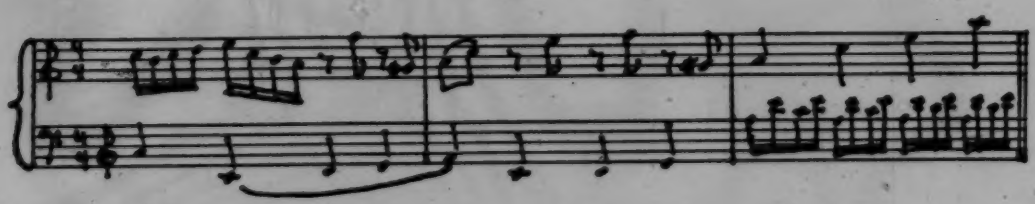
Transformations do not always radically alter the underlying deep structure. There are transformations which involve simple adjustments on the musical surface (such as a grouping overlap), so that deep and surface structure do not appear significantly different. Also, every surface need not necessarily be a transformed version of an underlying deep structure. Carl Schachter

describes this aspect in relation to tonal music.

> The "surface" of tonal music then is by no means always an opaque cover concealing an underlying structure of an altogether different nature. The underlying structure (in its several levels of elaboration) is often to a large extent present in the surface. 2

Grouping structure involves two main transformations: grouping overlap[3] and elision.[4] In a grouping overlap, one event on the music surface both completes a previous group and begins a new one. The rule for such transformations can be stated as follows: $X + E_1 + E_2 + Y \longrightarrow X + E_1 + Y$ (where $E_1 = E_2$). Example 6 shows a simple case of grouping overlap.

Example 6. Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 28-30.



There is a grouping boundary between mm. 29-30. However the a minor triad on the first beat of m. 30 completes the harmonic movement of the preceding group. Even though melodically the beat would clearly group with those following it, harmonically it is necessary to the understanding of the previous group. In this case, one event on the music surface is shared by two groups at the deep structure level, thus resulting in a grouping overlap.

The other transformation common to grouping structure, elision, is similar in nature to the grouping overlap. In the case of elision, there may be two groupings resulting from a single time-span but the groups do not involve the same pitch events. In the case of an elision, a new grouping begins (perhaps in another voice or instrument) at the same time that another grouping is completed. The two groupings would share the same time-span but would be separate melodically. Example 7 shows an elision where a new melodic group begins in the upper voice while the bass completes the previous melodic group.

Example 7. Schumann, Waldscenen, "Freundliche Landschaft" mm. 45-48.

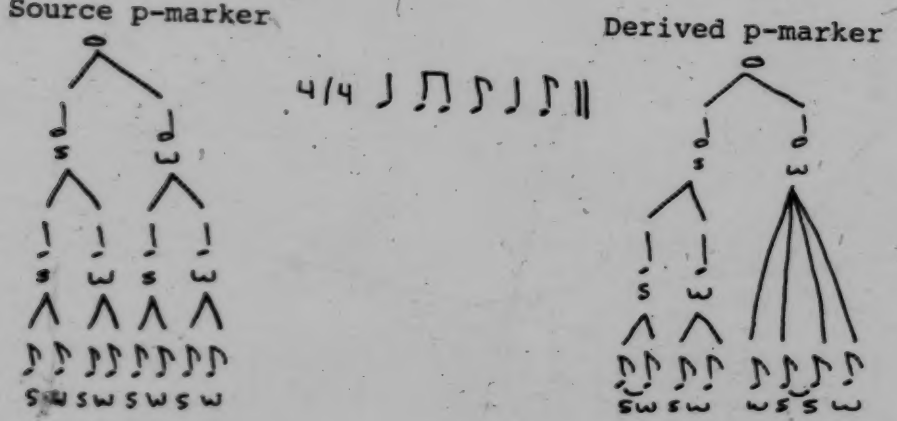
In m.46, a new melodic group begins on the second beat while the bass sustains the harmony from the preceding measures. A new melodic group does not begin in the bass until the first beat of m. 47. This example also contains a grouping overlap since the tonic harmony on the first beat of m. 47 also serves to complete a cadential movement, resolving the dominant harmony of mm. 45-46. (The grouping and metric structure of this piece will be examined in

greater detail in Chapter Six.)

The transformations which affect the metric deep structure involve familiar processes such as syncopation and hemiola. The rhythmic surface of a musical work involves a variety of patterns of accentuation and levels of movement. The metric deep structure results from a synthesis of the various patterns into a coherent whole which dominates the elements of which it is made. Thus, the rhythmic surface contains many levels of rhythmic motion. Some of these will exhibit the characteristics of the metric deep structure. Others may be transformations of the prevailing metric pattern which result in syncopations or cross accents on the musical surface.

The syncopation transformation involves the operation of permutation -- that is, the rearrangement of adjacent constituents in the phrase marker. Constituents are detached, permuted in the new order and reattached to the last node which dominated both in the source p-marker. Syncopation can be seen as a permutation of the order of strong and weak beats set up by the deep structure. Figure 5.1 shows the pattern of strong and weak beats in the source and derived p-markers for a simple syncopation. The order of strong and weak beats is permuted at the eighth-note level. The permuted elements in the diagram are reattached at the next highest node which dominates them in the p-marker. This means that the permuted eighth-note

Figure 5.1: Syncopation Transformation



pulses are dominated as a group at the next highest metric level, which in this case is the half-note level. This simple permutational process can create more complex syncopations when it is applied at higher rhythmic levels, such as the complete-measure level, or between two measures, or when it is used on more than one structural level at the same time.

Other metric transformations use processes which are as simple as the syncopation transformation. The use of unusual subdivisions of a beat or measure would be considered as transformations of the expected divisions implied by the metric deep structure. The operation involved is that of substitution. For instance, in common time, a triplet eighth-note figure could be substituted at the quarter-note level or five sixteenth notes could be substituted for the normal four. As with the syncopation transformation, the substituted subdivision would be

dominated in the derived p-marker by the next highest level that contained the whole grouping. Therefore, the subdivision into five sixteenth notes would be dominated at the quarter-note level, not the eighth-note level.

One further metric transformation would involve cross accents such as hemiola. In cases such as these, there will be on the rhythmic surface a level of movement which does not comply with the accentual patterns of the deep structure. As stated previously, the deep structure implies a variety of rhythmic levels which are posited as belonging to that meter whether or not they are actually used in the particular passage under examination. Correspondingly, there are levels of movement which will not be considered as part of the metric deep structure. These rhythmic levels will be explained as transformations involving the operation of addition. The rhythmic surface will contain levels of motion which have been added to those implied by the deep structure. Example 8 briefly shows such an additional level of motion.

Example 8. Brahms, Intermezzo in b minor, Op. 119, No. 3, mm. 1-3.

The compound meter is well established in the opening measures of the example, phenomenal accents signalling the division of the measure into two beats, each a dotted quarter note in length. In the second measure, an additional rhythmic level which acts as a cross accent to the metric deep structure is intoduced. The repeated G's in the inner voice imply a level of rhythmic motion that divides each measure into three quarter notes. This level of motion becomes more important as it is exploited later in the composition. (See Example 9.)

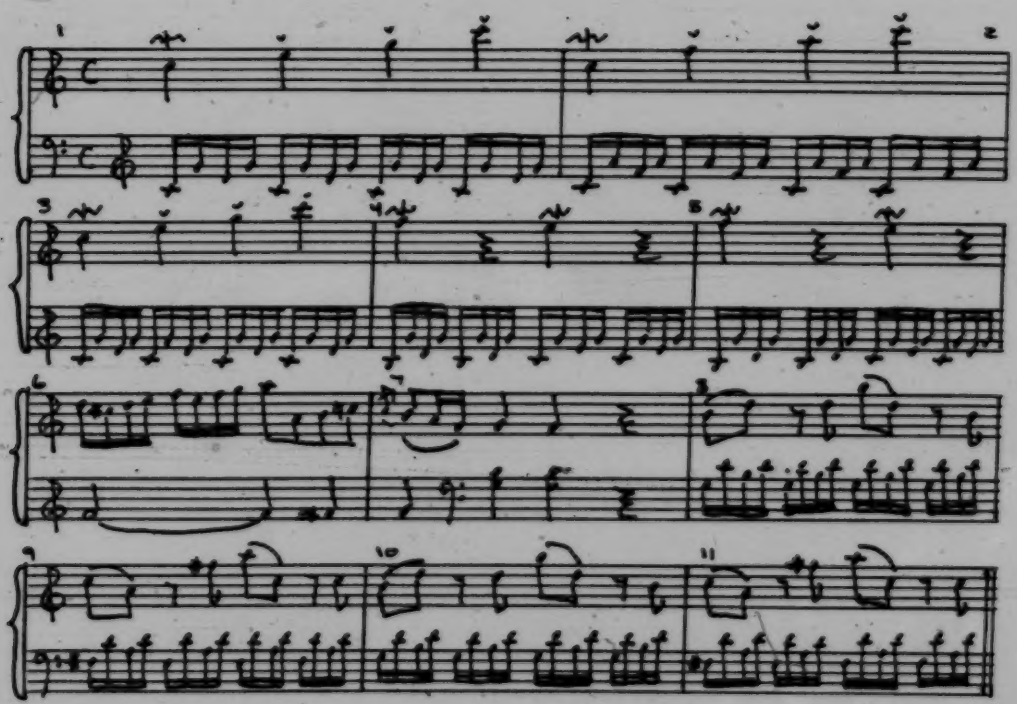
Example 9. Brahms, Intermezzo in b minor, Op. 119, No. 3, mm. 41-43

This transformation does not use the addition operation in quite the same way as in linguistic transformations. In the rhythmic transformation, an additional node is not added at one point in the phrase marker; rather a whole level of structure (both when actually realized and when only implied) is added to the phrase marker.

There are transformations which involve the interaction of grouping and metric structure. At larger levels, the metric deep structure prefers an alternation of strong

and weak beats. (See Lerdahl and Jackendoff's Metric Preference Rule for Binary Regularity.)[5] However, there will often be cases where because of irregularities in grouping, two consecutive beats are felt to be strongly accented. Such a shift in the overall metric pattern is explained as a deletion of a weakly accented beat. (See Example 10.)

Example 10. Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 1-11.



The first phrase cadences in m.7, the cadence occurring on a metrically strong measure. The tendency is to feel that the new phrase in m.8 also starts on a strong measure, an intuition which is reaffirmed by the harmonic

movement. The structurally more stable tonic harmony is found in mm. 8 and 10, causing the listener to feel those measures to be more strongly accented. Mm. 8-11 form a group which influences the tendency to hear them as a typical four-measure phrase alternating strong and weak measures. There is no evidence to counteract these instinctive perceptions. In order to account for the shift of metric accent, a weakly accented measure is assumed to have been deleted from the deep structure. Lerdahl and Jackendoff have described a similar type of transformation in conjunction with grouping overlap and elision called metric deletion.[6]

The main process of harmonic constituent transformation, embedding, has already been discussed in Chapter Four. The basic progression of tonic - dominant - tonic can be elaborated into the variety of actual harmonic phrases found in music by the embedding of full progressions into one another, by the use of the subdominant function to prolong tonic or cadential motion, and by the expansion of individual constituents by such means as the applied dominant. The more embedding a phrase undergoes, the more elaborate it becomes. The embedded harmonies form part of the deep structure, not just the surface structure, but the identification of an embedded structure, and of what might constitute the matrix harmonic progression can contirbute to the comparison of musical phrases. If two

passages were to exhibit the same degree of embedding, or to follow the same harmonic progression except for one particular embedded motion, an important parallel might be established between the phrases, which could influence the understanding of the formal scheme of a piece.

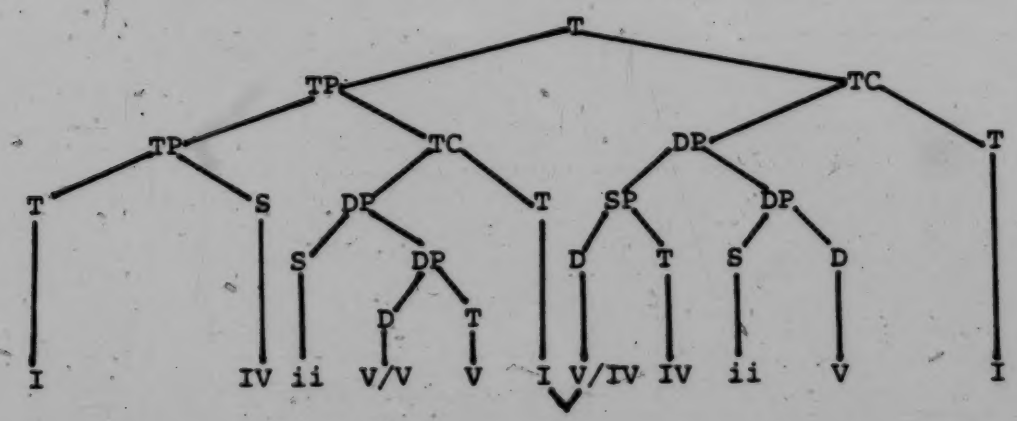
As stated at the beginning of the chapter, transformations can elaborate underlying structure, or they may conceal that which can only be made explicit on the deep structure level. Harmonic constituent structure demonstrates this property with transformations that result in surface structures which are less explicit.

One such transformation is similar to a grouping overlap in that one pitch event serves more than one function. In this case, one chord or pitch event functions in two ways on the deep structure level. A familiar example is a pivot modulation. The pivot chord has two functions, one in each key, and a knowledge of both functions is necessary for an understanding of its use in the phrase. A modulation is not the only case where such a chord may be employed. In a progression containing the harmonies V/ii - V/V - V, the V/V chord is understood to serve two functions. The chord is heard as both the tonic completion of the dominant that precedes it and as the secondary dominant of V. Although represented on the musical surface by a single pitch entity, the deep structure would use two representations of the chord to show the double

function it carries, one being deleted in the music surface. Example 11 shows a chord which serves two functions.

Example 11. Schumann, Waldscenen, "Einsame Blumen", mm. 1-10.

Figure 5.2: Harmonic Structure with Double Function Chord



In m. 7 of the example, the Bb chord functions as both a tonic completion and a subdominant prolongation. In this particular example, the first beat of the measure functions as the tonic completion and the second beat as

the subdominant prolongation. Although metric position separates the two functions, the whole bar would still be considered as a single chord. An important factor which influences the view of the measure as one harmony is the fact that the root of the chord is only sounded once, on the first beat of the bar. If D were considered to be the root of a different chord on the second beat of the measure, one would expect to have the third of that chord present. without it, the case for two separate harmonies is weakened. Another factor involved is the harmonic rhythm of the piece which has been established as one harmony per measure. This further confirms that m.7 is one harmony with two functions, rather than a tonic chord followed by the diminished seventh of the subdominant. (Allan Keiler has described this type of chord function and proposed the use of lines beneath two chord functions which are represented by one pitch event on the musical surface.[7])

Transformations may be used not only to delete one occurrence of a double-function chord, but also to delete a chord which is understood on the deep structure level but which is absent from the music itself. Again, in this instance, the deep structure will be more explicit than the musical surface. For example, a progression may contain the following harmonies: V^7/IV - ii^6 - V - I. The deep structure would need to show the presence of a subdominant chord before the supertonic for the progression

to be explicit. However, on the surface, the subdominant is omitted (or merely implied by the use of the supertonic in first inversion). Since the deep structure must account for that which is essential to the meaning of a passage, it will show explicitly such relationships when they are necessary to the understanding of the harmonies in a phrase.

The chord progressions discussed so far have employed a limited range of harmonic material. One reason is that expanded tonality, such as was the practice in the latter part of the nineteenth century, involves different principles than those found in the common-practice period. An important idea for the use of transformational grammar is to recognize that various musical styles are comparable to a variety of languages. Each has its own specific rules peculiar to the idiom while retaining other points which are common to more than one or to all the "languages" in question. (Lerdahl and Jackendoff discuss this point in their examination of musical universals.)[8] This paper has confined itself to the description of the syntax of tonal music of the common-practice period. (Chapter Seven will deal briefly with the possibilities of constructing a deep structure for other idioms.)

There are, however, within the confines of common-practice tonality, other harmonies which would follow along the same principles as the basic triads mentioned up to

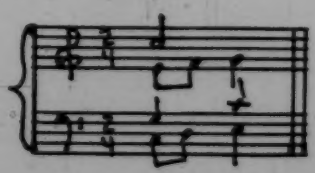
this point. For example, chromatically altered chords such as the Neopolitan Sixth or Augmented Sixth chords can be included in the theory. Both types of chords function as subdominants, progressiong generally to the dominant or dominant function chords. Other chords such as diminished sevenths can be substituted wherever a dominant chord might be used and so forth. Nondominant seventh chords generally function in the same manner as the triad itself. Their lack of stability relative to the triad would be reflected in their use within the time-span reduction.

The effect of a change of mode on constituent function is less clear. For a simple case, one such as a borrowed minor subdominant, where the function of the chord is determined by root progression, not by chord quality, the chord would be viewed as a simple transformation using the substitution operation. In other cases, such as a minor dominant, the chord quality might affect its function and it would have to be considered as a separate constituent type. The particular point in the composition where a change of mode is employed may be syntactically important to the overall structure of the piece. In each case, the particular context would have to be taken into account to determine the effect of the change of mode on the harmonic syntax.

Pitch structure, as represented in the time-span reduction, does not involve the same type of grammatical

transformations as other aspects of the deep structure. The reason for this is that the multi-levelled structure of the reduction accounts for the methods of melodic elaboration within the single diagram. For example, in Figure 5.3, the reduction shows how the tonic triad, the most stable event at the half-note level, is elaborated by its inversion on the quarter-note level; the two triads are then further elaborated on the eighth-note level by the passing notes.

Figure 5.3: Melodic Elaboration

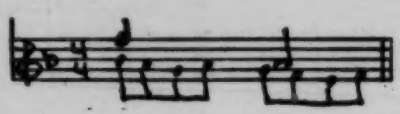


In this manner, all the pitch connections from the musical surface to the most remote reductional levels are accounted for in the one diagram. Where the time-span reduction differs from the musical surface is at the larger reductional levels, where a pitch event which lasts for a quarter-note duration on the music surface is prolonged over a full measure time-span and so forth.

One other point where the music surface differs from the relationships shown in the time-span reduction involves the metric placement of time-span heads. The most stable reduction exists when time-span heads occur in metrically strong positions (see Lerdahl and Jackendoff's time-span

reduction preference rules).[9] The surface pitch patterns of a passage can be transformed when the most stable pitch events occur in metrically weak positions, as in Figure 5.4, where, because of the accented passing tones, the most stable pitch events occur on the metrically weak half of each beat.

Figure 5.4: Metrically Unstable Time-span Heads



The difference between the instability of the pitch event on the musical surface and its reductional importance causes tension in the music and may in some cases tend to obscure the larger-scale pitch connections.

The conventional means by which pitch connections are elaborated (passing tones, neighbour notes and so forth), and the means most commonly used to shift stable pitch events to weak metric position (accented passing tones, appogiaturas, suspensions and the like), are well known and so do not need to be described in detail here.

Motivic or thematic transformation is the most visible type found in music. This type of transformation does not involve an alteration of syntax between the deep and surface structure levels. Motivic transformation involves the preservation of a surface pattern of pitches and durations. This type of transformation involves not constituent types, as is usually the case with grammatical

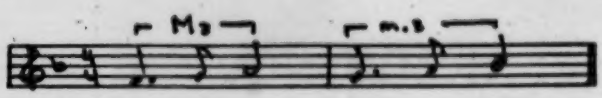
transformations, but the terminal symbols themselves.

As stated previously, a thematic unit adds a level of syntactic structure to its constituent events by placing an order on its elements and thus setting up syntactical relationships between the positions of constituents. For example, a theme may be comprised of three motives in an order such as A + B + A + C. If the motives are treated as constituents, their order in the theme can be transformed by the standard operations. Addition might yield A + B + A + C + A, substitution A + B + A + D, permutation A + A + B + C and so on. (Osmond-Smith has detailed all of the possible variations.)[10]

There are other motivic transformations which preserve the syntactical relations contained within a motivic unit. One of these is transposition. Octave equivalence allows a pitch to retain its identity despite register. This property allows chord spacing to be a matter of surface structure. Though register placement may have some effect on the melodic relationships of the time-span reduction, and changes in register contribute to grouping and metric deep structure, the spacing of a chord does not affect its identity or harmonic function. Similarly the transpositions of a motive through octave equivalence does not affect its identity. Furthermore, transposition of a motive to another scale degree within the tonal idiom preserves the intervallic relationships

which make up the motive. The consequent intervallic distortion of such transposition (which Osmond-Smith calls melodic displacement)[11] is accepted by the system. (See Figure 5.5).

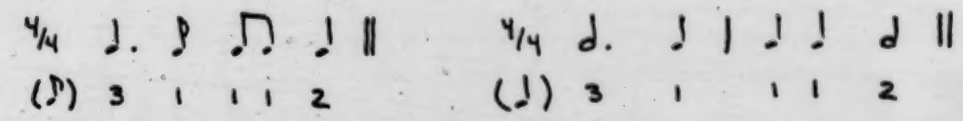
Figure 5.5: Melodic Displacement



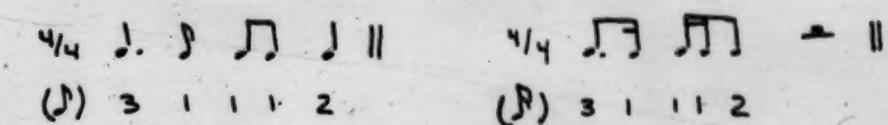
The rhythmic syntax of a motive can also be conserved under certain transformations such as augmentation and diminution. In both cases, the durational proportions which constitute the syntactical relations of the rhythmic motive are conserved. The actual durational values will be related to the original motive by a whole integer multiple, most commonly two or four. (See Figure 5.6.)

Figure 5.6: Transformation of Durational Proportions

Augmentation



Diminution



The recognition of a motivic transformation is necessary to the perception of parallelism, which in turn affects deep structure on metric and grouping levels. Melodic elaboration, through the methods mentioned previously, is an important factor in motivic transformation. In order to be perceived as transformations, a motive and its elaboration must be similar on some level of the time-span reduction. The closer that level is to the surface structure, the more readily the two events will be perceived as being parallel. Figure 5.7 shows the time-span reduction for Example 12. On the quarter-note reductional level, the pitch structure is the same as that of the original melody, "Twinkle, Twinkle, Little Star" and so the example would be considered a motivic transformation of the original theme. (The bass line of the two examples is essentially the same and so has been deleted from Figure 5.7.)

Motivic transformation may involve changes in one parameter such as pitch, while retaining the shape in another parameter, such as rhythm; or there may be changes in more than one or even all parameters. There is no limit to the number or type of changes which a motive may undergo while still retaining a perceptible link to the original idea. This factor differentiates motivic transformations from truly grammatical ones, since in language the number and type of transformations is finite. Certain

Example 12. Mozart, Variations on "Ah, vous dirai-je Maman." mm. 25-32.

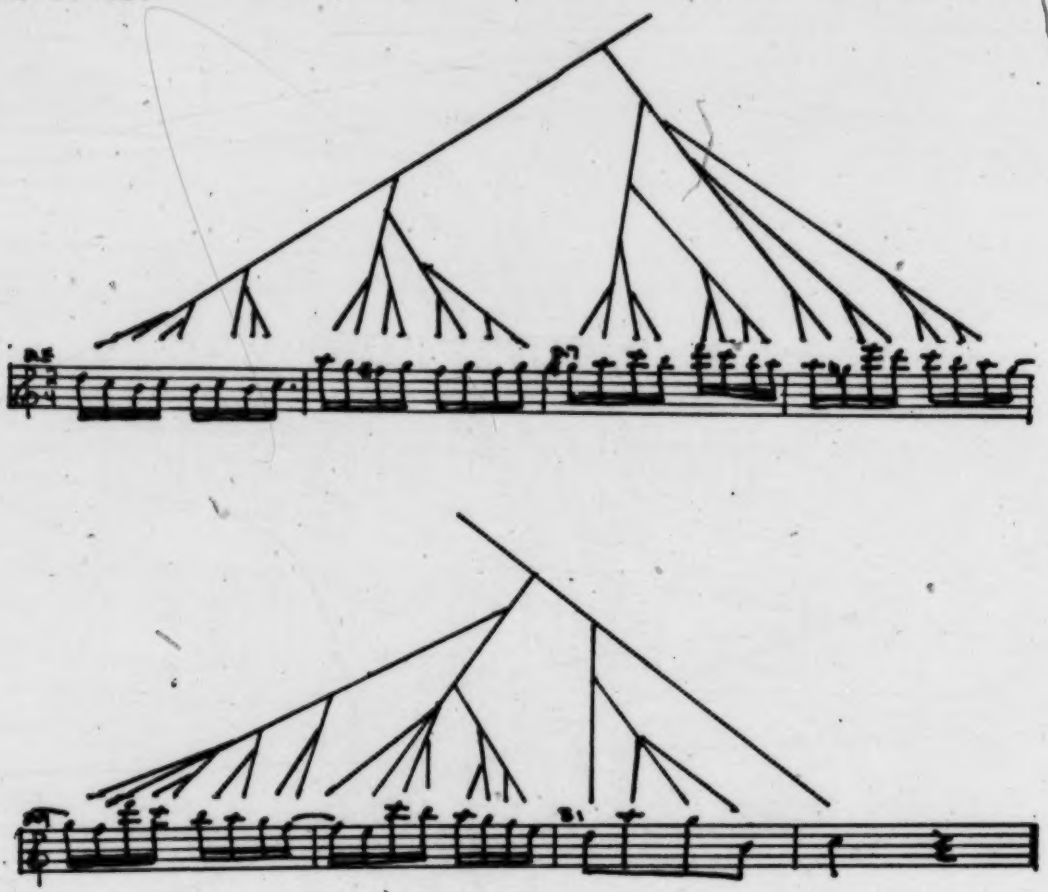
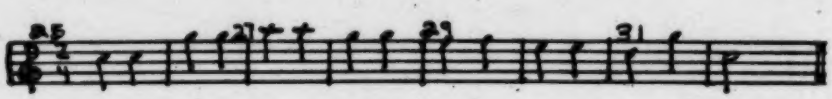


Figure 5.7: Time-span Reduction at Quarter-Note Level



transformations of syntax are not permissible because they result in ungrammatical utterances. For motivic transformation, there is no point at which a melodic idea can be termed ungrammatical, and so there can be no restrictions on motivic transformation.

One final aspect of the concept of transformation in music structure remains to be discussed. The recursive power of language stems from the transformational processes of embedding and conjunction. The process of conjunction can be applied in music structure to a certain degree.

The deep structure components, in particular grouping and time-span reduction, have been discussed basically in reference to homophonic music. Contrapuntally oriented music could be incorporated into the theory by considering the whole as a conjunction of several voices. The structure of each voice could be detailed individually prior to an analysis of the interaction of the whole. As in language, the class of statements to be conjoined would be subject to certain restrictions. Principally, the intervallic relationships between voices, and their harmonic implications, would be constrained according to the stylistic preferences of the genre in question.

In summary, the abstract relationships of the deep structure level are both altered and obscured on the musical surface. The means by which the structure is changed is the transformational process. Through the application

of these grammatical operations, the relationships attributed to the music as part of the process of musical cognition are altered to become the confluence of events which determines the aural surface of the music.

NOTES

[1]Allan Keiler, "Music as Metalanguage : Rameau's Fundamental Bass," Music Theory : Special Topics, Richmond Browne ed. (New York: Academic Press, 1981), p. 93.

[2]Carl Schachter, "Rhythm and Linear Analysis : A Preliminary Study," Music Forum, 4(1976): 310.

[3]Lerdahl and Jackendoff, A Generative Theory, p. 60.

[4]Ibid., p. 61.

[5]Ibid., p. 101.

[6]Ibid., p. 104.

[7]Keiler, "Bernstein's The Unanswered Question," p. 219.

[8]Lerdahl and Jackendoff, op. cit., pp. 278-281.

[9]Ibid., p. 160.

[10]David Osmond-Smith, "L'Iconisme formel : pour une typologie des transformations musicale," Semiotica, 15 (1975): 39 - 41.

[11]Ibid.

CHAPTER SIX: APPLICATIONS IN ANALYSIS

Having defined those aspects of music deemed important on a deep structure level, the means by which they can be represented, and the ways in which the deep structure both differs from and is related to the musical surface, it is necessary to determine the practical applications of the concept in music analysis. As stated in Chapter One, neither deep structure nor transformational grammar is a method of analysis. The extraction of an abstract structure, underlying the musical surface and representing the syntactical relations found in a piece of music, is not an end in itself.

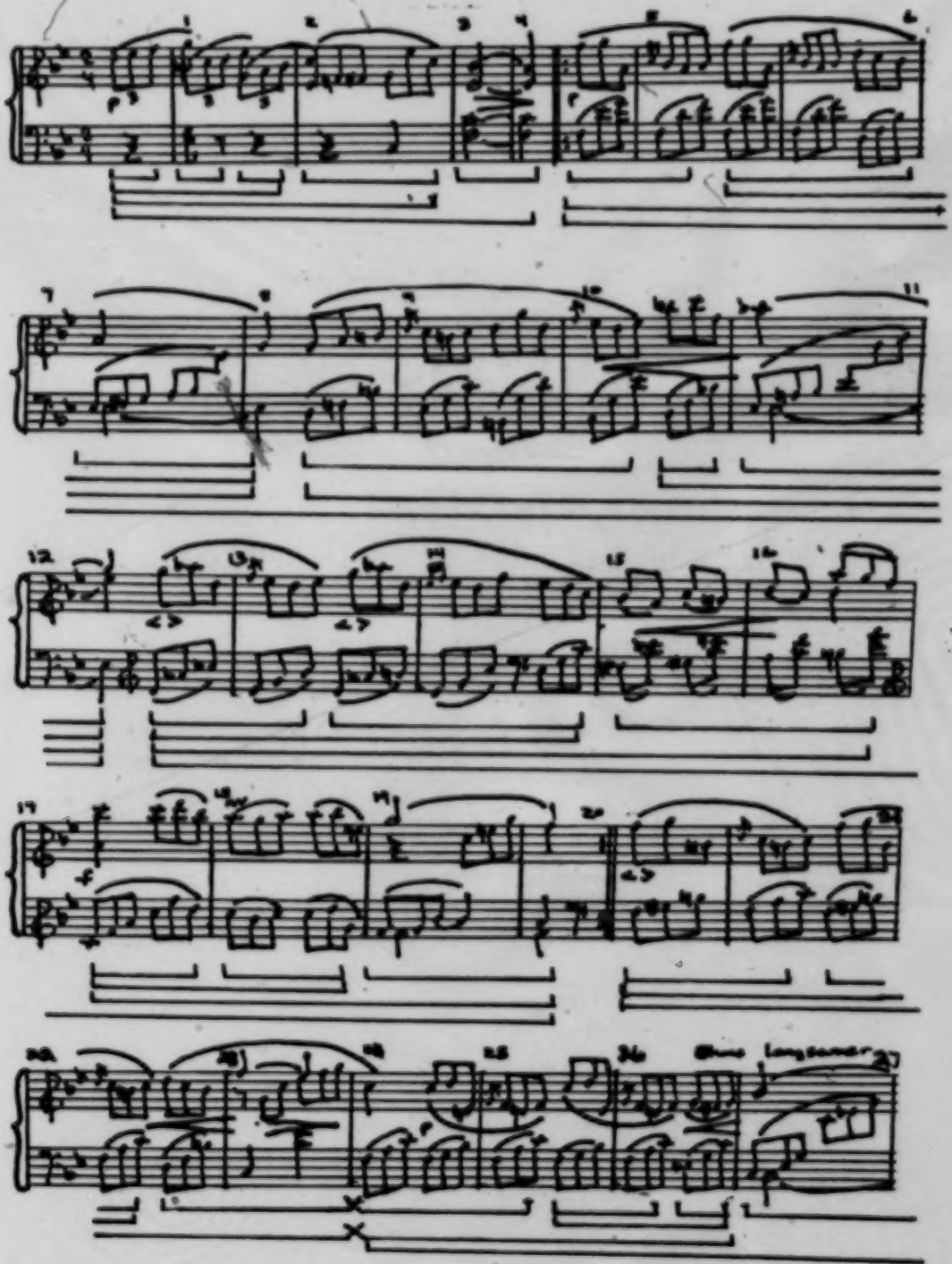
The deep structure concept is a way of explicitly stating the grammatical relationships which function in a musical work which may not be apparent from an examination of the musical surface. A knowledge of these syntactical relations can be put to use in an analysis to show how or why certain structures are perceived as being similar, ambiguous or otherwise important to an understanding of the formal structure of a piece. In conjunction with other types of analysis, reference to musical deep structure may confirm analytic insights intuitively perceived or it may help to clarify passages which otherwise would seem inexplicable.

An examination of Schumann's "Freundliche Landschaft" from Waldscenen, (see Example 13), will demonstrate how an examination of the deep structure -- in this case the metric and grouping structures -- can account for the complexities of the musical surface in a coherent fashion.

In this piece there is a high degree of rhythmic ambiguity caused by the out-of-phase grouping and metric structure. (The grouping structure is diagrammed in Example 13.) A coherent underlying metric structure can still be ascertained from the accents occurring on the musical surface. The piece is notated in 2/4 time, although the constant use of the eighth-note triplet figure implies 6/8 meter. Which time signature is used is really a matter of notational convenience; in either case the primary metric pulse is established as duple, an alteration of strong and weak pulses at the quarter-note level. In this instance, the opposition of two against three is not carried out as the interaction of two conflicting levels of rhythmic motion. Rather, it is merely a substitution of one type of subbranching of the metric pulse for another, and as such is not a deterrent to the perceived metric pattern of duple meter.

Figures 6.1 and 6.2 show the metric deep structure for the first and second halves of the piece (the repetition of mm. 5-20 creates two equal parts of thirty-six measures each). The diagrams show the metric structure starting at the quarter-note level and include the expectations for

Example 13. Schumann, Waldscenen, "Freundliche Landschaft", mm. 1-27.



Example 13 (cont.). Schumann, Waldscenen, "Freundliche Landschaft," mm. 28-56.

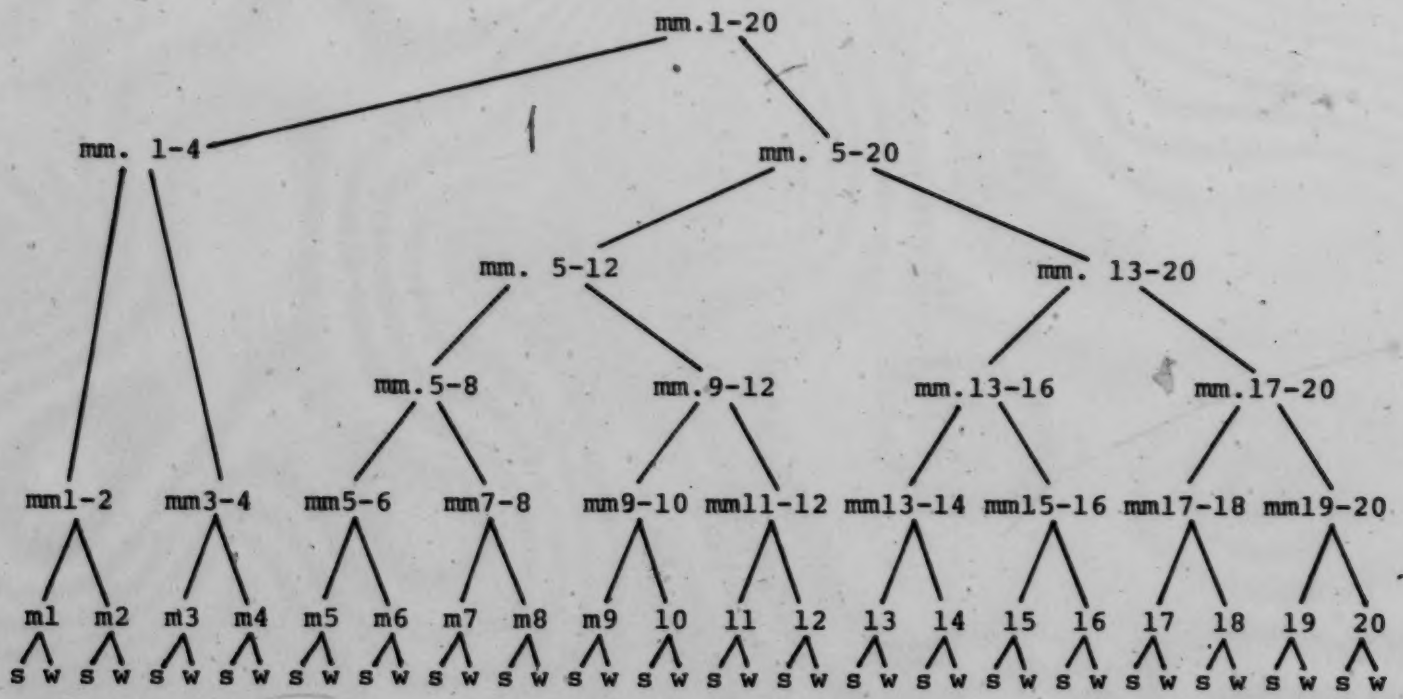


Figure 6.1: Metric Deep Structure, Schumann, Waldscenen, "Freundliche Landschaft", mm. 1-20

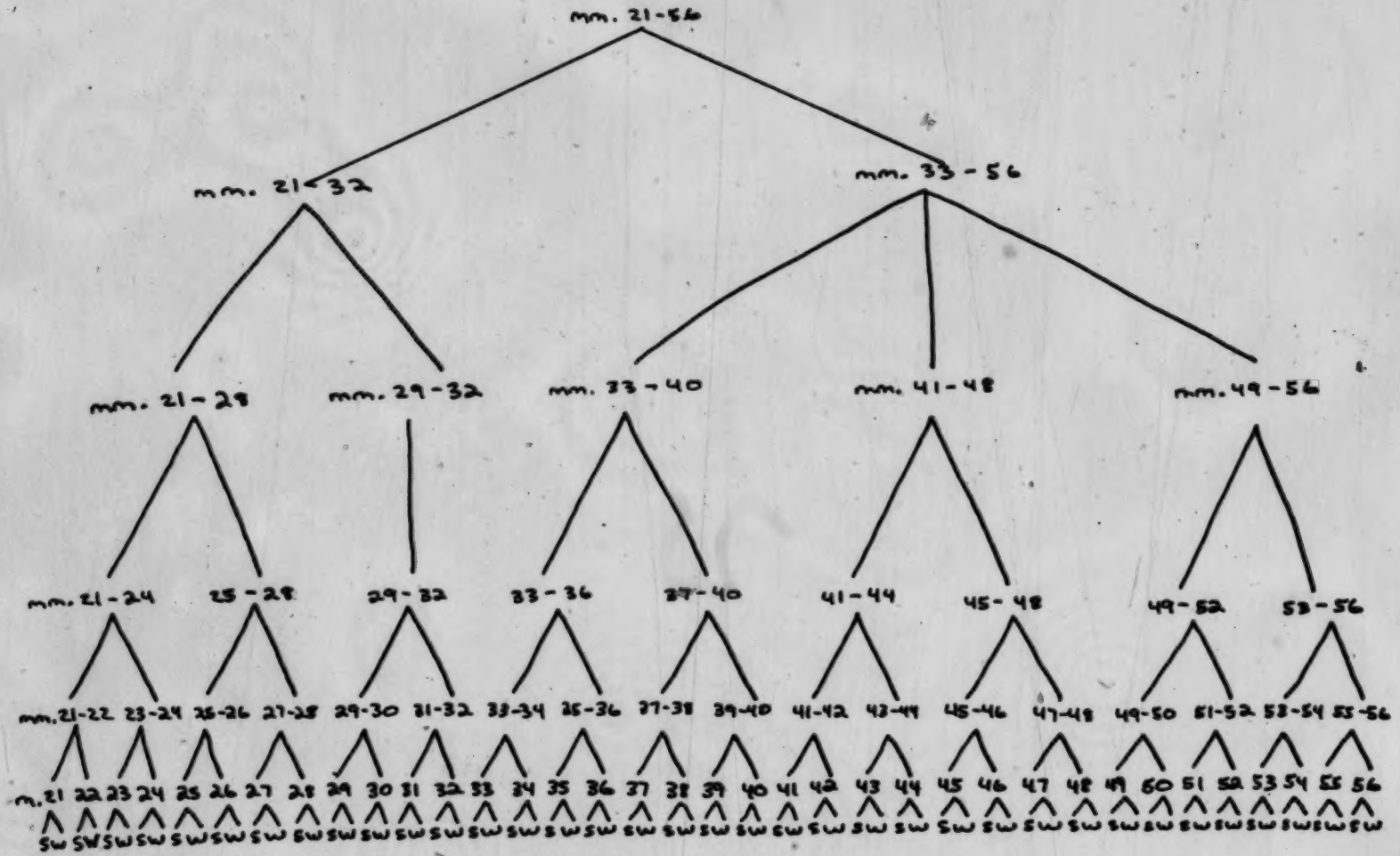


Figure 6.2: Metric Deep Structure, mm. 21-56.

hypermeasures of two, four and eight measures.

Both halves of the piece show a fairly close adherence to those expectations at the two-and-four measure level. Although there are a number of eight-measure groupings, the piece is not divided at that level in the most symmetrical prototypical manner. In the first half of the piece, mm. 5-20 divide evenly into two groups of eight measures each, which in turn subdivide into two four-measure groups in the expected manner; but they are preceded by a four measure group (mm. 1-4), which does not form part of a larger eight-measure group. In the second half of the piece there is another four-measure group (mm. 29-32) which does not combine to form an eight-measure group and thus disturbs the ideal of total symmetry.

The metric pattern is established in the first four measures (see Example 14). The entrance of the bass on the downbeat of measure one establishes that beat as the strong pulse with the preceding notes felt as an upbeat.

Example 14. Schumann, Waldscenen, "Freundliche Landschaft," mm. 1-4.

The rhythmic cadence in mm. 3-4 establishes a second metric

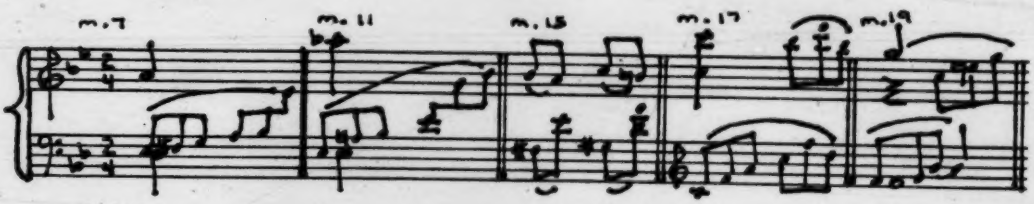
level at intervals of a half note so that the listener expects an alternation of strong and weak measures. Although the grouping conforms to four-measure hypermeasures, the beginnings of these units are consistently out-of-phase with the metric structure so a third metric level is never firmly established. There are only two instances where grouping and meter are in phase thus allowing a strong pulse to be felt at the four-measure level. The first occurs at m. 17 with the beginning of the cadential group for the first half of the piece. The second occurs in m. 49 which is the beginning of the last phrase of the second half of the piece.

The pattern of alternating strong and weak measures is reaffirmed at four-measure intervals throughout the piece -- in other words every second time it is expected. For example, in mm. 5-20, extra stress would be expected at the beginning of mm. 5, 7, 9, 11, 13, 15, 17 and 19. In mm. 5, 9 and 13, out-of-phase grouping and meter prevents a phenomenal accent from articulating the expected metric strong beat.

For the remaining expected articulations, various types of phenomenal accent are used to indicate the metric stress (see Example 15). In m. 7, the half note adds the extra stress; m. 11 also involves a stressed long note in the melody. M. 15 involves a change in the rhythmic subbranching from compound to simple division which gives an added stress to that measure. M. 17 involves the change back to compound division, a slight change in register and

a quarter-note in the melody, while m. 19 involves another phenomenal accent caused by a note of longer duration.

Example 15. Schumann, Waldscenen, "Freundliche Landschaft," mm. 7, 11, 15, 17, 19.



The pattern is borne out in the second half of the piece where stress occurs in mm. 27, 31, 35, 39, 43 (the change of rhythmic subbranching again), 45, 49, 51, 53 and 55. (In mm. 29 and 47, the restoration of tempo adds a stress to the first beat of the measure but the grouping structure is out-of-phase at both points so the accent is contradicted by the stress which the grouping structure puts on the previous beat.) (See Example 16.)

Example 16. Schumann, Waldscenen, "Freundliche Landschaft," mm. 28-29, 46-47.

It can be noted that in most cases the deep structure metric accent is reaffirmed at the end of each four-measure group and always at the end of a larger-scale group. Furthermore, the cadence in m. 20, which closes the first section,

is preceded by three two-measure groups which are in phase, and the phenomenal accent reflects the metric structure (see Example 17); while in the second half of the piece, the last four two-measure groups all have corresponding phenomenal and metric accents (see Example 18). A definite pattern of the ebb and flow of rhythmic tension is established. Groups start with a high degree of rhythmic ambiguity and tension which is resolved towards the cadence with resolution coming earlier for the endings of larger-scale groupings.

Example 17. Schumann, Waldscenen, "Freundliche Landschaft," mm. 15-20.

Example 18. Schumann, Waldscenen, "Freundliche Landschaft," mm. 49-56.

The points of metric ambiguity in the piece occur at the quarter-note level where the primary pattern of alternating strong and weak beats is felt most strongly. The grouping structure (see Example 13) consistently contradicts the divisions and strong-beat placement anticipated by the metric deep structure by grouping across metric boundaries. The phenomenal accent caused by the articulation of the grouping boundary consistently places the stress on a metric weak beat. The "four-measure" groups generally cover a duration of eight beats as expected, but they are displaced a beat across the bar line (and, more significantly, a beat from the deep structure expectation) to cause the conflicting accents.

Rhythmic ambiguity resulting from out-of-phase grouping is present at more than just the four-measure level. As stated, the four-measure groups involve the expected number of beats, but in order not to accent the metric strong beats, the groups are not subdivided into segments of two or four beats. For example, mm. 5-8 subdivide into segments of two beats and six beats each. Mm. 9-12 divide into two groups of four but the second group is subdivided into segments of one and three beats in order to place the meter and grouping again in phase and thus to continue the pattern of metric accents at group endings. (See Example 19.) Mm. 13-20 actually divide into groups of nine and seven beats respectively.

Example 19. Schumann, Waldscenen, "Freundliche Landschaft," mm. 5-12.

The extra beat is added to the first grouping in order to place grouping and meter again in phase so that the last group before the cadence can start on a metric strong beat at both the quarter-note and half-note levels. (See Example 20.)

Another pattern noted from the examination of the deep structure involves the metric placement of the cadences. Every cadence (and every group ending at the four-measure level or higher) ends on a metric strong beat but only at the quarter-note level.

Example 20. Schumann, Waldscenen, "Freundliche Landschaft,: mm. 13-20.

The final cadence of the piece reaches the tonic Bb in m. 55, which is a metric strong beat at both the half-note and quarter-note levels. It is the only cadence with this metric placement, and the addition of the second level of metric accent causes the cadence to be felt as more strongly accented, and thus it has a greater sense of finality than the preceding ones.

For the most part, the rhythmic tension in the piece is generated by out-of-phase grouping and metric structure at the quarter-note level. There are also a few instances where tension is caused by permutations at the eighth-note level. The two sections where the triplet eighth notes are replaced by the (notationally expected) duple subdivision have previously been pointed out. In these cases, one full beat of compound meter is replaced by one beat of simple meter. There is no displacement of the position of the strong beat at the eighth-note level; it is always the first eighth note in the group. Since the primary metric accent has been felt at the quarter-note level, there is no disruption of the prevailing metric pattern. Although the change in sub-branching does add a certain amount of rhythmic tension (even though the piece is notated in 2/4 time, the triplet has been established as the expected sub-branching); at the point where it is first introduced in m. 15, it actually helps to clarify the meter since it initiates the in-phase six-

measure segment of rhythmic clarity before the cadence in m. 20. (See Example 18.)

Tension increases in the second half of the piece with the return of the out-of-phase grouping. Following that, a very weak group-ending caused by a grouping elision appears in m. 24, where a stronger four-measure group-ending is expected. (See Example 21.)

Example 21. Schumann, Waldscenen, "Freundliche Landschaft," mm. 22-25.

The melody completes a group on the first beat of the measure, but the bass does not define a clear grouping boundary at that point. The change in rhythm from quarter-note motion to the triplet eighth-note figure on the first beat of m. 24 indicates a grouping boundary in the bass at that point. The arpeggio on the first beat would most likely group with the beat following it because of similarity. Therefore, the measure is defined as a grouping elision, with a new group beginning in the bass before the previous group ends melodically. The lack of a complete rhythmic cadence in both voices leaves a residue of rhythmic tension which propels the music forward

to the point of highest rhythmic tension in the phrase. That point is found in m. 29, where, for the first time, there is a permutation of the metric pattern on the eighth-note level. (See Example 22.)

Example 22. Schumann, Waldsecnen, "Freundliche Landschaft", mm. 29-32.

On the eighth-note level, the metric pattern is permuted as before by grouping across metric boundaries, this time at the quarter-note level. The grouping boundary places phenomenal accent on the second of the three eighth notes into which the beat is subdivided, instead of on the first. The tension generated by this disruption of metric patterning is resolved by the cadence in mm. 3 -32, which is the strongest rhythmic cadence in the second half of the piece (with the exception of the final cadence).

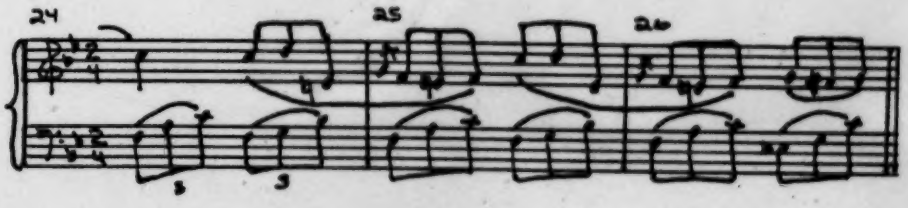
The high degree of tension caused by this type of out-of-phase sub-branching is again used strategically in mm. 41-42. (See Example 23.) In this case, it is followed by a change to duple division where the weak beat at the eighth-note level continues to be accented in mm. 43-44. At m. 45 the metric pattern is restored at the eighth-note level but

Example 23. Schumann, Waldscenen, "Freundliche Landschaft," mm. 41-46.

the elided cadence in m. 46 (previously discussed in Chapter Five) does not allow for a complete resolution of rhythmic tension. M. 49 restores in-phase grouping and meter and a clear correspondence of metric and phenomenal accent. There are no further distortions to the metric structure in the remaining measures of the piece.

There are a few instances in the piece where pitch patterns momentarily establish cross rhythms with the metric pattern but this is not consistently used and does not constitute a major part of the rhythmic complexity of the piece. Example 24 shows one such occurrence in the melodic line.

Example 24. Schumann, Waldscenen, "Freundliche Landschaft," mm. 24-26.



The reiteration of the interval of a second between C and D and then Eb and F briefly sets up a level of motion at the

rate of two eighth notes within the triplet eighth-note sub-branching of the passage.

From the preceding analysis, it is obvious that the metric structure, in its various hierarchical levels, affects all aspects of rhythm and also grouping perception. The use of a metric deep structure is necessary to show explicitly the relationships between the underlying patterns of beats set up in the listener's mind and the actual pattern of stresses arising from the events on the musical surface, as well as the interaction of grouping and metric structure. Those relationships determine how the surface events are interpreted by the listener in relation to abstract metric structure to determine their meaning.

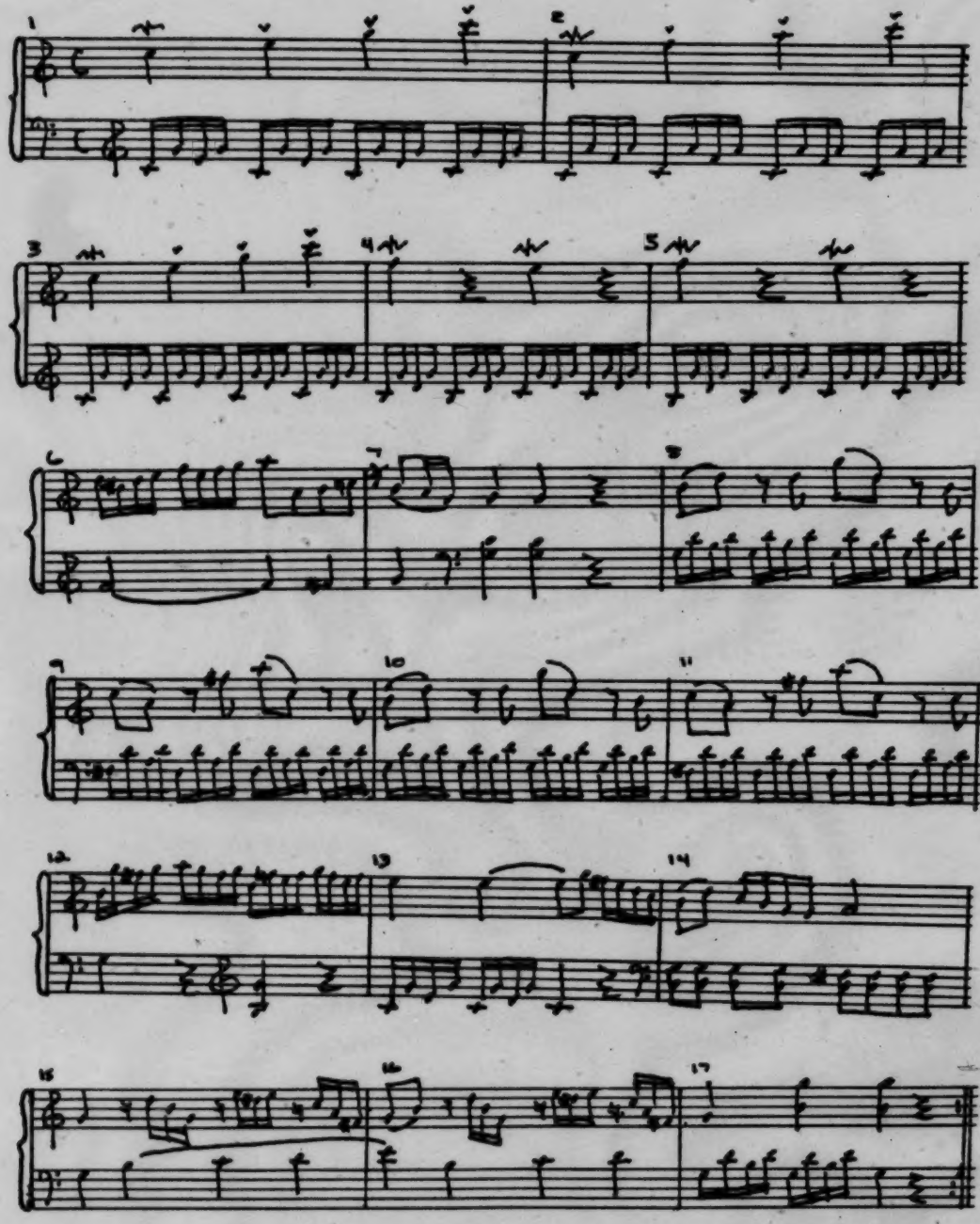
When diagramming the harmonic deep structure of a piece, one often finds that the results are not radically different from those obtained by other methods of analysis such as simple chord constituent descriptions. However, constituent analysis does more than simply label the underlying harmonies contained in a phrase. It explicitly shows the function of each chord and the relationships among them. It forms a hierarchy which groups the chords into larger-scale functions such as those that constitute the cadential structure of the phrase and those which serve as prolongations of material before and after the cadence.

Once having abstracted the chord functions from the music (questions as to whether a pitch complex establishes

a harmony or is just a confluence of passing embellishments can be clarified by reference to the time-span reduction), the constituent structures of phrases can be compared. It may be revealed, for example, that certain patterns of embedding, or the use of right-branching structures, are features common to two phrases or are a significant factor in the formal structure of a piece. Two phrases may be related by a similar pattern of chord functions even though one phrase may be in the tonic key while another functions around another tonal area. In cases where the surface thematic material has been altered considerably or is dissimilar, the uncovering of a similar harmonic deep structure can reveal an important type of structural parallelism between two phrases.

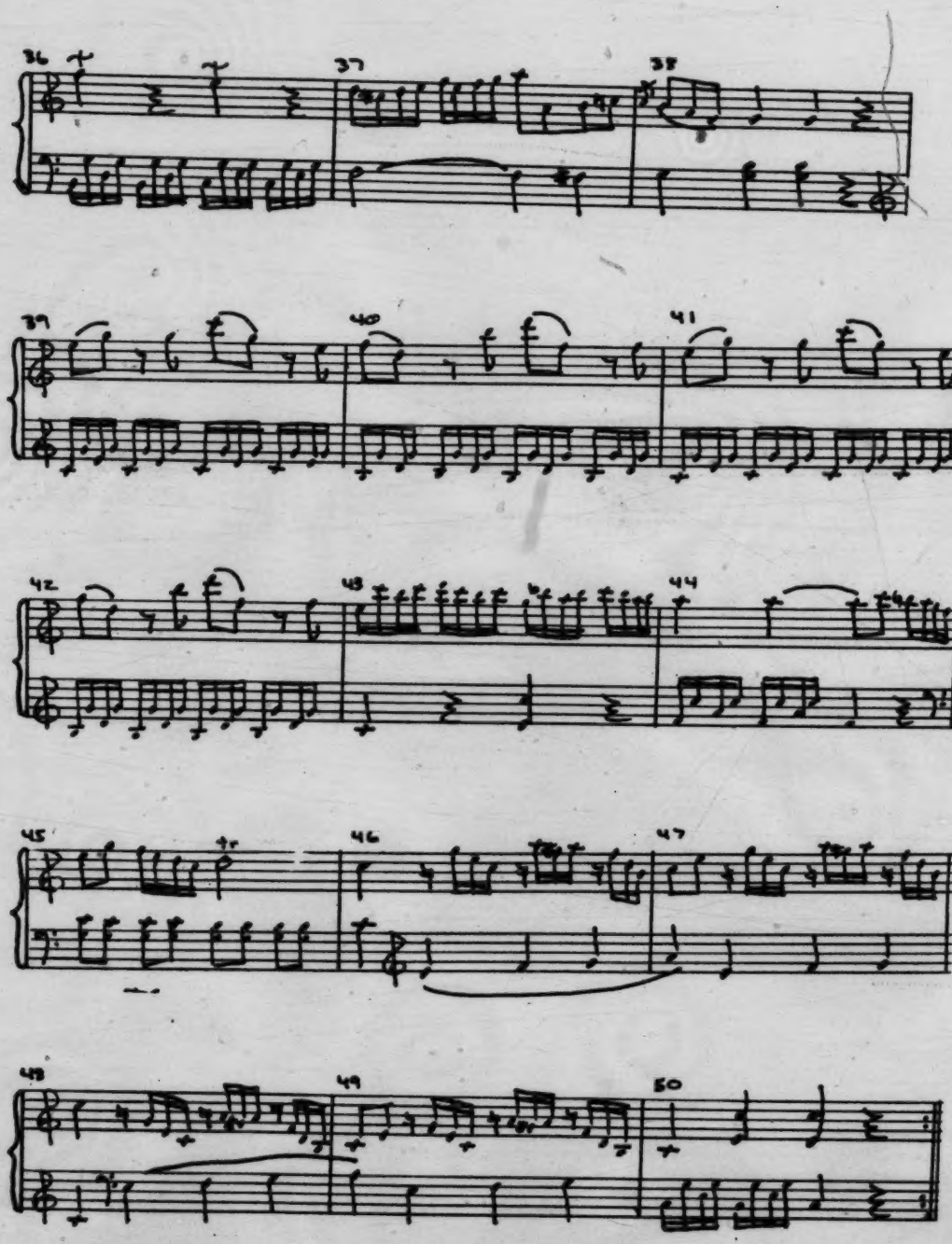
An examination of the first movement of Haydn's Sonata in C, Hoboken XVI: 1 (See Example 25) will demonstrate how harmonic constituent structure can explicitly show all the relevant connections among harmonic constituents which may or may not be apparent on the musical surface. These connections may occur between constituents which are contiguous and also between non-contiguous elements. Examples 26 to 31 and Figures 6.3 to 6.10 diagram the harmonic deep structure of each of the six phrases in the movement. Each embedded motion is numbered and that number is placed under the appropriate chords in the accompanying examples to make clear to which chords the diagram refers. (Allan Keiler suggested numbering each embedding when he presented his model for harmonic structure.)[1]

Example 25. Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 1-17.



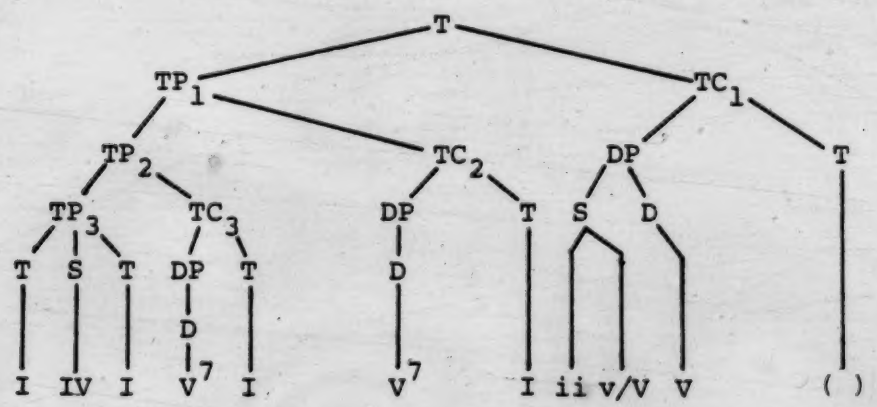
Example 25 (cont.). Haydn, Sonata in C, Hoboken XVI: 1 First Movement, mm. 18-35.

Example 25 (cont.). Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 36-50.



Example 26. Haydn, Sonata No. 1, Hoboken XVI: 1, First Movement, mm. 1-7.

Figure 6.3 : Harmonic Constituent Stucture, (measures 1-7).



Example 27. Haydn, Sonata in C, Hoboken XVI:I, First Movement, mm. 8-17.

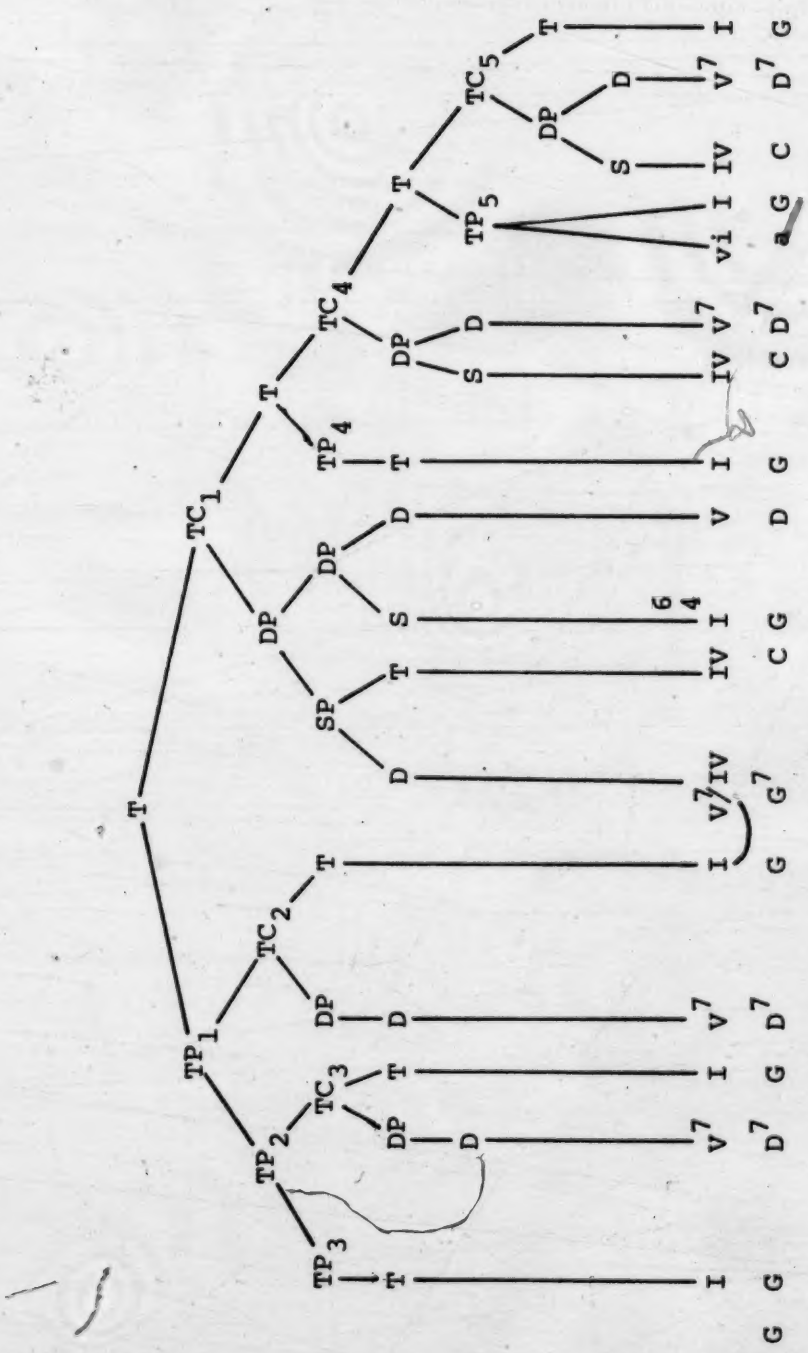


Figure 6.4: Harmonic Constituent Structure, (mm. 8-17).

Example 28. Haydn, Sonata in C, Hoboken XVI:1, First Movement, mm. 18-23.

Figure 6.5: Harmonic Constituent Structure (mm. 18-23)

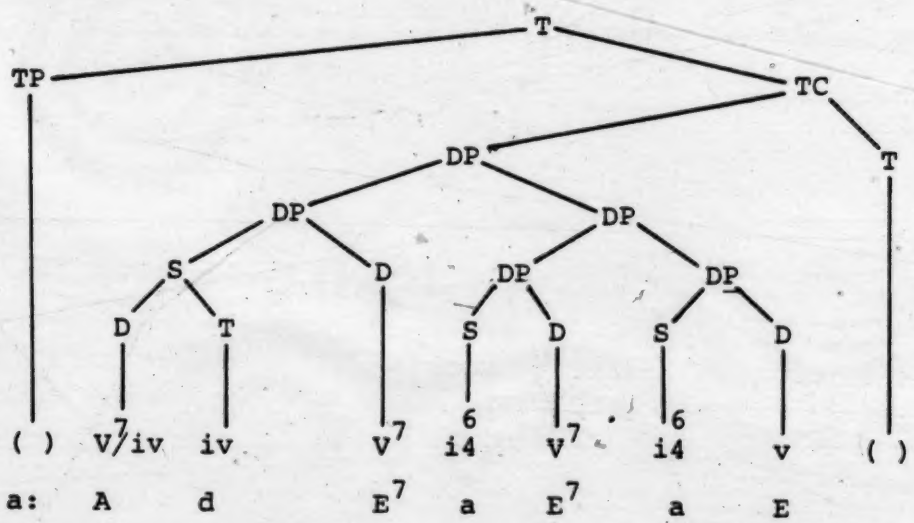
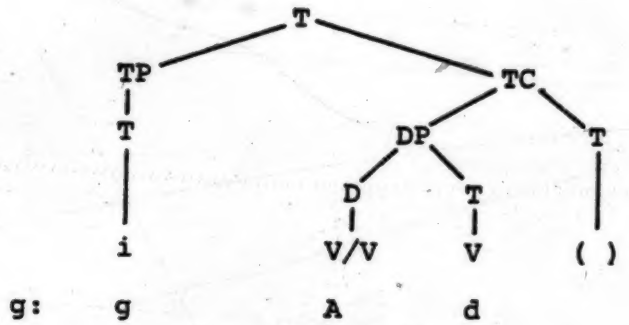
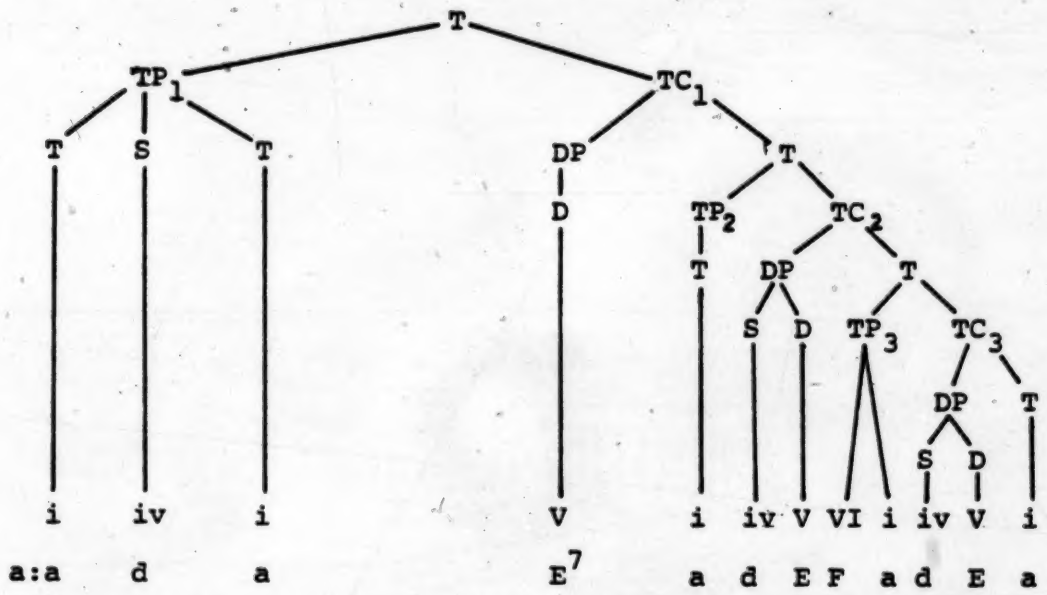


Figure 6.6: Harmonic Constituent Structure (mm. 18-20).



Example 29. Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 24-29.

Figure 6.7: Harmonic Constituent Structure (mm. 24-29)



Example 30. Haydn, Sonata in C, Hoboken XVI: 1, First Movement, mm. 30-38.

Figure 6.8 : Harmonic Constituent Structure, (mm. 30-38).

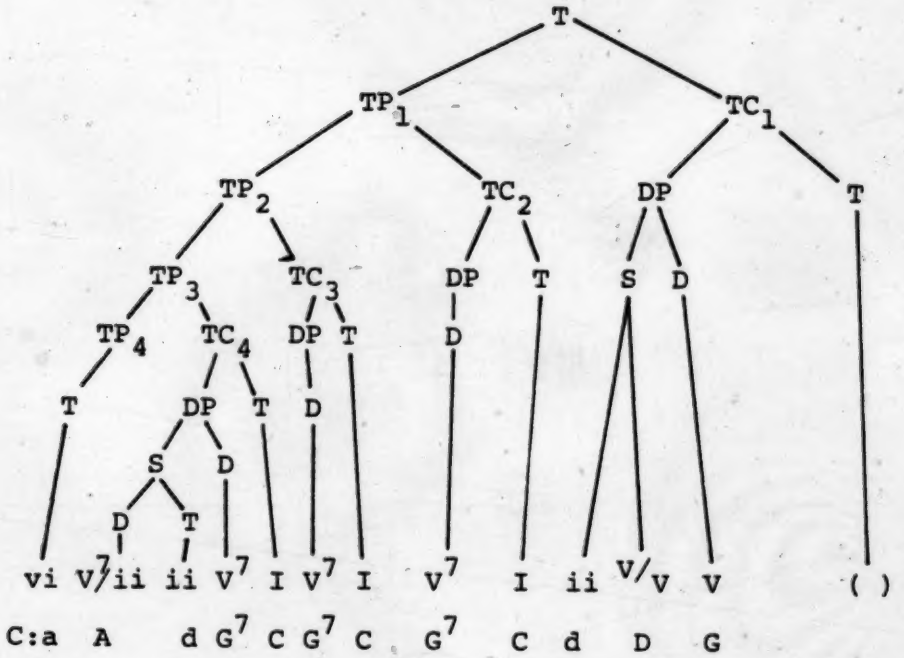
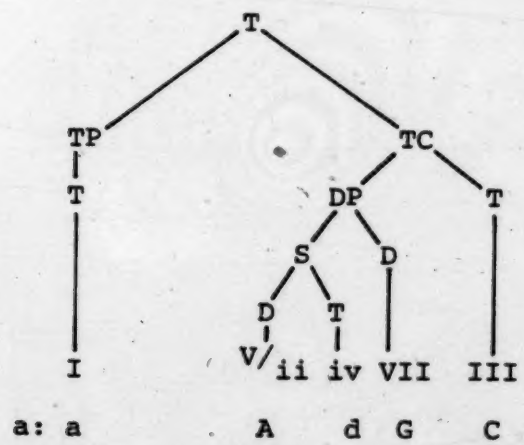
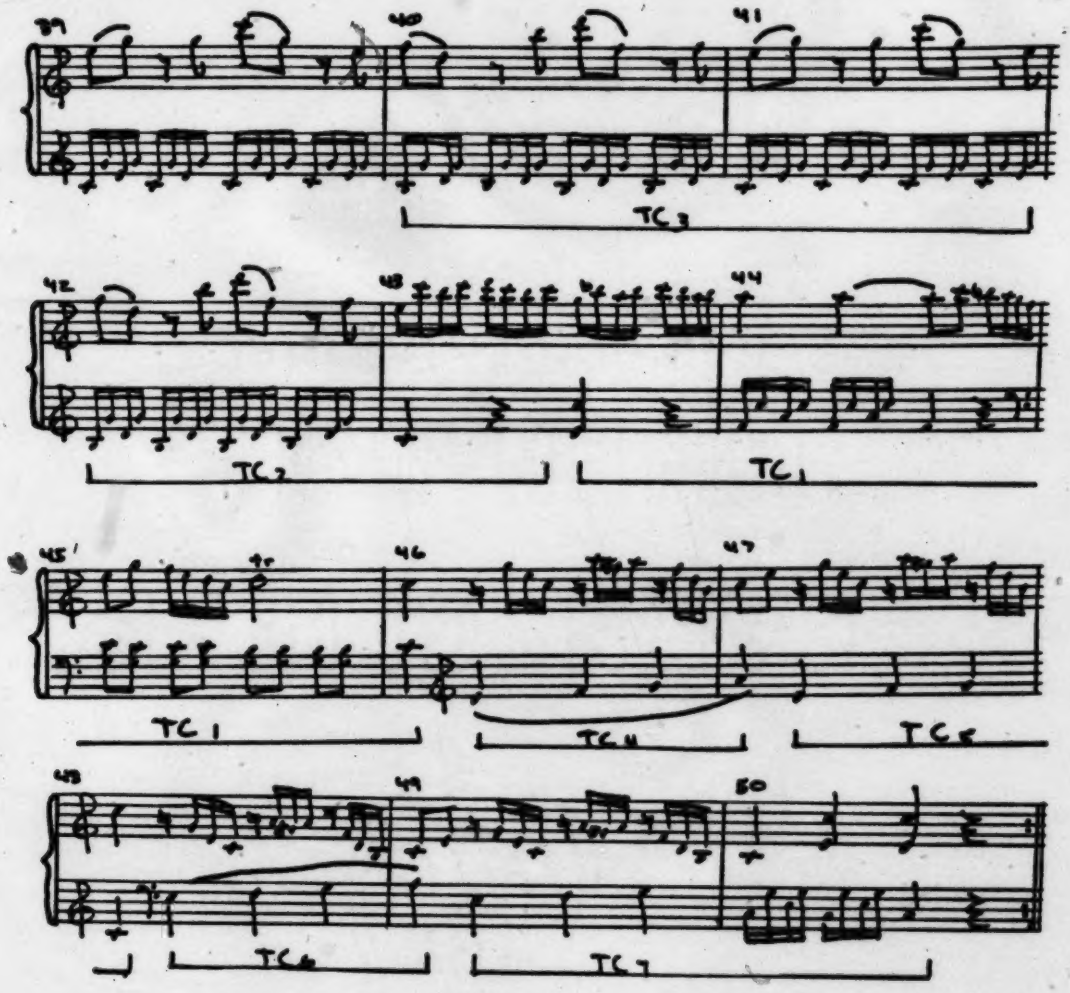


Figure 6.9 : Harmonic Constituent Structure, (mm. 30-34).



Example 31. Haydn, Sonata in C, Hoboken XVI: 1 , First Movement, mm. 39-50.



The terminal symbols of the harmonic constituent structure do not appear significantly different from the notation a simple chordal analysis would produce. Where the phrases have modulated, the chords are analyzed in the new key in order to simplify the chord symbols and to show clearly the functional relationships such as movement from the dominant to tonic and so forth. What the constituent trees show, which chord labelling does not, is the hierarchy

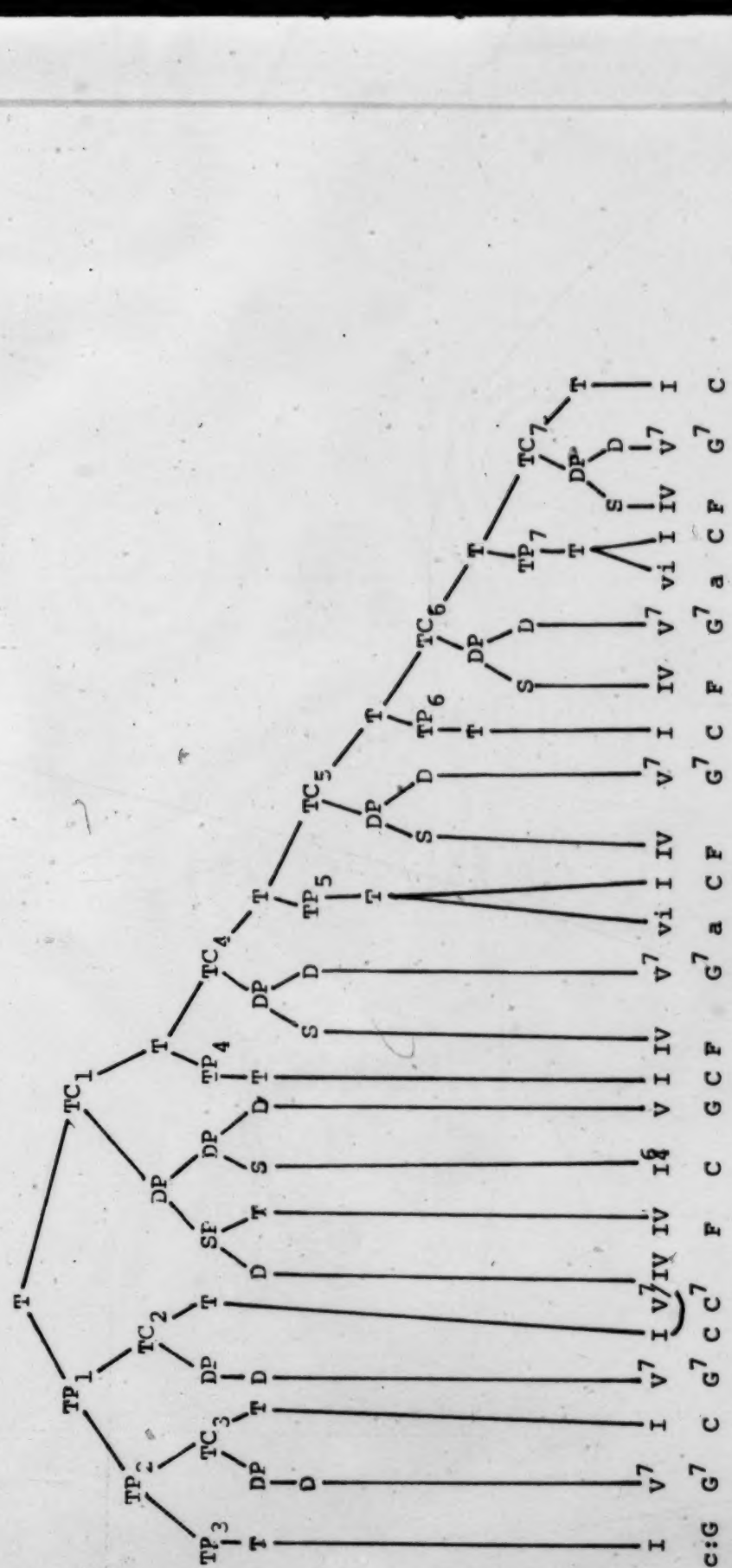


Figure 6.10: Harmonic Constituent Structure (mm. 39-50).

of groupings of chord functions and the relationships between non-contiguous elements. The trees also indicate the omission of chords -- such as an implied tonic at the end of a half cadence -- in certain functional slots.

There are one or two areas where the analysis is not quite as straightforward. Mm. 18-20 receive two possible deep structures as there are two plausible ways in which the chords may be interpreted. Because it is not until the half cadence at m. 23 that a minor is firmly established as a tonal center, the listener is unsure at the beginning of the phrase whether or not to continue with G as a tonal center (with a change of mode to g minor), or with some new, as yet unspecified tonal center. In retrospect, the most plausible explanation is to interpret the whole progression in a minor, although when first encountered, such a case is not made clear. The two deep structures for the passage indicate the tonal ambiguity of that point in the music and highlight the function of the progression as transitional.

Mention has already been made in Chapter Five of the grouping overlap in m. 30 (See Example 32.) The a minor chord completes the cadence of mm. 24-29 and begins a new phrase at the same time. In this new phrase there is again a question about the tonal center. By measure thirty-three the B major triad reestablishes the C major tonality and the opening a minor chord of the phrase can

Example 32. Haydn, Sonata in C, Hoboken XVI: 1, First movement, mm. 28-34.

be interpreted as a submediant functioning as a substitute for the tonic triad. However, at the beginning of the phrase, a minor is still established in the listener's mind so once again, two deep structures are posited to account for the tonal ambiguity.

On examination of the overall harmonic structure, a number of interesting points are brought to light. The most salient of these is the pattern of full and half cadences. The first, third, and fifth phrases end in half cadences; the second, fourth and sixth have full cadences. The two groups of phrases receive different structural treatment corresponding to the types of cadence they exhibit. Those phrases ending with a half cadence are constructed using only left-branching embedding. The phrases which contain a full cadence use both left- and right-branching structure. Phrases two and four (see Figures 6.4 and 6.7) both have two progressions embedded after the cadence while

phrase six (Figure 6.10) has four progressions embedded after the cadence. The marked similarity between the constituent structures of each of the two phrase types gives the work an underlying symmetry which adds to the clarity of its form.

Another interesting point which the analysis brings to light is the use of the subdominant as part of the dominant prolongation. In each phrase, the subdominant function is omitted in the progressions embedded before the cadence. The use of the subdominant is restricted to some of the cadences and all of the right-branching progressions after the full cadences. This seems to be a structural detail used to simplify the harmonic structure. The multiple embeddings before the cadence omit the subdominant slot and focus solely on tonic and dominant harmony. (The tonic six-four functions as a subdominant in mm. 18-23 but this phrase does not contain any embedded progressions.)

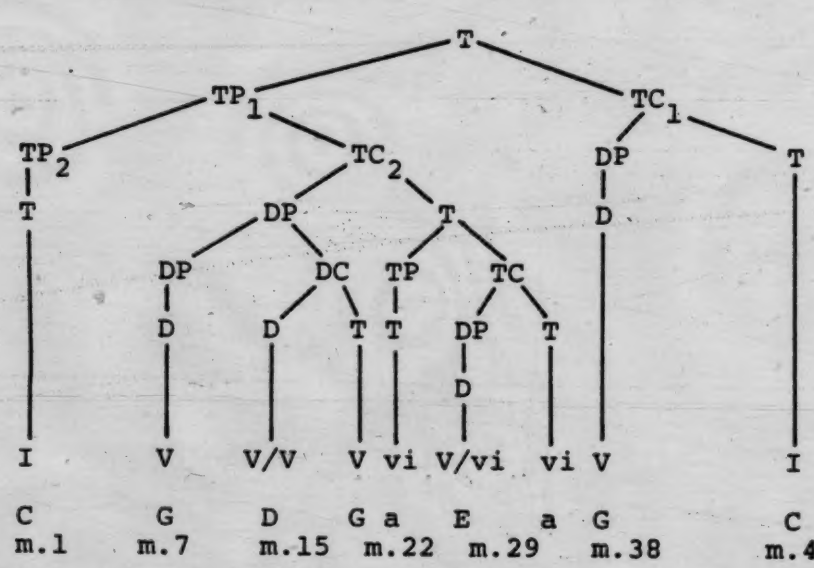
The two exceptions to this occur in the transitional passages in mm. 18-20 (see Example 28), and mm. 30-34 (see Example 30). Both these passages involve a change of tonal center, and the use of the subdominant function makes for a more gradual transition and ultimately a stronger perception of the new tonal center.

In the particular piece examined here, most of the structural parallelisms can be deduced from the musical surface. Thematically, phrases one, three and five are

related. The fact that one and five exhibit the same kind of harmonic structure only reinforces the already perceived similarity. Phrases two and six also employ similar thematic material. Phrase four, although it does use motivic material from earlier in the piece, does not contain the same thematic idea as the other two phrases. However, the similarity of deep structure with the use of right-branching structures links the phrase with phrases two and six and so continues the pattern of structural parallelism.

A constituent structure for the whole piece can be extrapolated from the harmonic deep structure of the phrases. Examining the cadences, we find that the piece moves through a half cadence in C to a full cadence in G, a half and a full cadence in a minor, and finally a half and full cadence in C major. Figure 6.11 shows a possible deep structure for the whole movement. TP_2 and TC_2 show the movement of phrases one, two, three and four. The dominant prolongation of TC_2 is represented in the music by the half and full cadences on G. The tonic in TC_2 is represented by the cadences in a minor. Instead of a resolution to C, the harmonic movement on a global level mirrors that of the post-cadential right-branching structures in phrases two, four and six by moving to the submediant, thus forming a deceptive cadence. TC_1 represents the half cadence on G and the only full cadence

Figure 6.11: Harmonic Constituent Structure, (mm. 1-50).



in C Major in phrase six.

On further examination, one notes that the deceptive cadence formed by the movement to a minor functions as part of a large-scale tonic prolongation embedded in the harmonic structure. Consequently, the highest-level non-embedded harmonic progression, represented in the diagram as TP_1 and TC_1, is a tonic - dominant - tonic progression in C Major. This will be the highest-level progression for all common practice pieces analysed by the theory. As such, it is roughly equivalent to Schenker's Ursatz. Pieces which are not common practice will receive more than one deep structure where they are ambiguous, will have incomplete functions where they have moved beyond the confines of the theory, or will have no analysis assigned in more radical cases. Lerdahl and Jackendoff confirm this point

in a discussion of the specifications for a generative theory of tonal music.

> If a given piece cannot be heard as tonal, the theory should be unable to give it a structural description; if a piece can convincingly be heard in several ways the theory should give it a structural description for each way of hearing it. 2

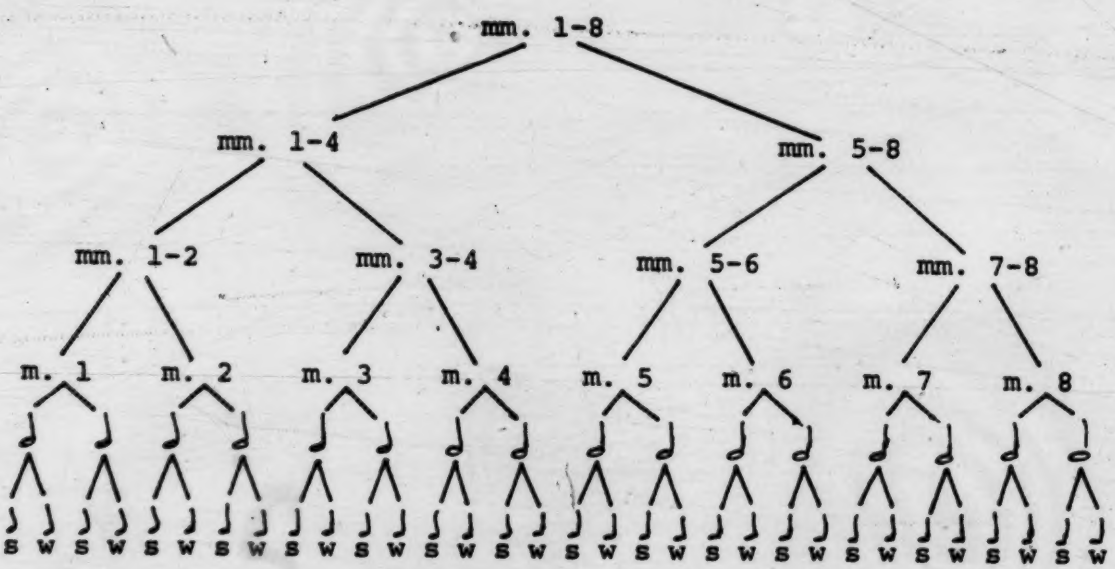
Following is an analysis of the four aspects of deep structure for a short Bach chorale.

Example 33. J.S. Bach, "Christus, der ist mein Leben."

The grouping structure is very straightforward. The rest in m. 4 divides the piece into two halves. The fermatas further subdivide each half into two more segments. There are no changes in register, dynamics, duration, means of articulation or motivic material which would cause any of the four units to break down into smaller groups. The grouping and meter are out-of-phase throughout the piece. Each two-measure group has a duration of eight quarter-notes but the groups all begin on an upbeat, one beat from the metric deep structure.

The metric structure (see Figure 6.12) is also clear.

Figure 6.12: Metric Deep Structure of Example 33



In m. 2, the retention of the same harmony on beats one and two establishes the eighth notes D and F as unaccented passing notes and so confirms the metric structure on that level. The repeated A's in the melodic line of m. 1 establish the half-note level of rhythmic movement and consequently the strong-beat placement at the quarter-note metric level on beats one and three of the bar. The half note in the melody in m. 2 and the two half notes in m. 4 establish the first beat in each measure as strong on the half-note level. The recurrence of tonic harmony on the first beat of mm. 1 and 3 (but not on the first beat of m. 2) indicates a two-measure level with the first measure more strongly accented. A four-measure metric level, though expected, is not specifically established.

The placement of cadences is carefully regulated. The cadences of phrases one and three occur on a strong beat at the quarter-note level only. The cadences of phrases two and four, however, occur in strong metric position at both the quarter-note and half-note levels. This lends them a stronger degree of closure in keeping with their larger-scale structural function.

The only transformation of metric structure occurs at the two-measure level. The initial measure in each group will normally receive the stronger accent. However, since a four-measure level is never established, this accent is not made clear. The phenomenal accents on the musical surface, in particular the placement of half notes, consistently places a strong accent on the first beat of the second measure in each group. The use of structural accent, at different times, confirms both accent placements. Structural accent for the initial tonic in phrases one and three occurs with metric strong accent on the first measure of the two-measure groups, but in phrases two and four the initial tonic occurs on a metric weak beat because of the out-of-phase grouping structure. Cadential placement in phrases two and four places the structural accent with the phenomenal accent on the second measure of each group. The use of these conflicting accents is carefully regulated and adds a controlled rhythmic tension to the music.

The harmonic constituent structure is shown for each

phrase in Figures 6.13 and 6.16. A constituent tree for the piece is given in Figure 6.17. Because of the brief length of the example, all harmonic functions are included. The phrases are simply constructed, generally with one embedding before the cadential motion. All embedding is left-branching, both for the two-measure phrases and for the structure of the whole chorale.

Example 34 contains the time-span reduction. The tree differs from that which would be constructed from an examiniation of the melodic line alone (see Figure 6.18), since it takes into account the harmonies employed. (Items connected in a tree by a circle indicate where an element is a prolongation of the whole cadence, not just one of its elements.) For example, in the first measure the A on the third beat is more stable than the Bb which follows it, but because it is harmonized by a highly unstable V^4_2/IV, the subdominant chord which follows it is heard as more stable in the harmonized version. The only cadence taken into account in the reduction of the melody is the melodic cadence at the end of the piece.

There may be differences in the functional implications of chords when examined from the time-span reduction and the constituent structure viewpoints. For example, in m. 1, the time-span reduction classifies the subdominant on beat four as an elaboratation of the opening tonic while the constituent structure shows its function as part of the cadential prolon-

Figure 6.13 : Harmonic Constituent Structure, (mm. 1-2).

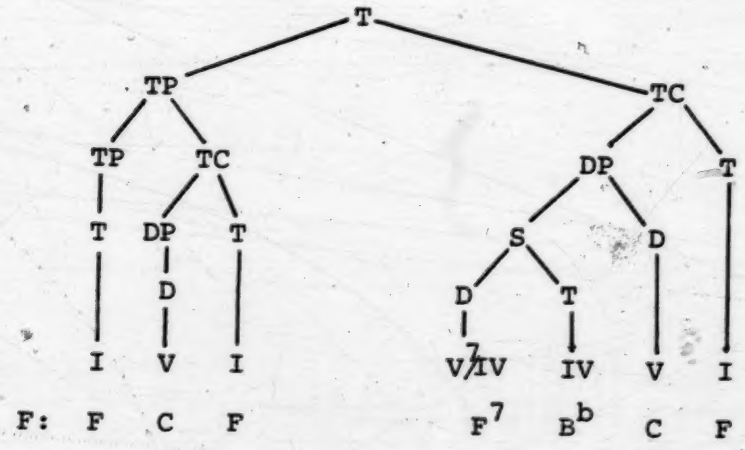


Figure 6.14 : Harmonic Constituent Structure, (mm. 3-4).

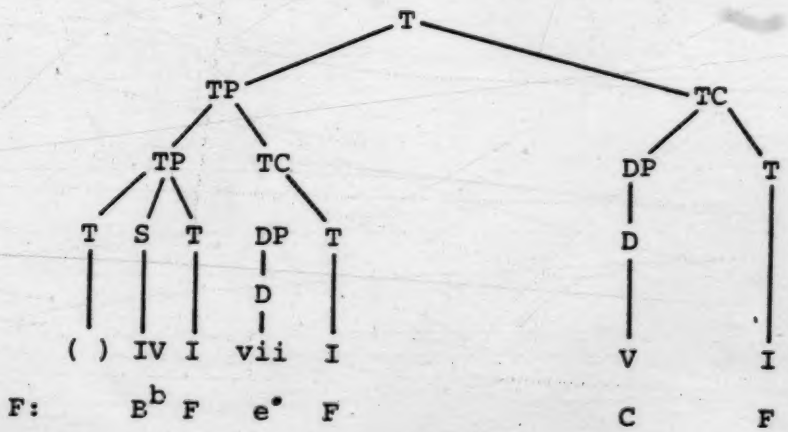


Figure 6.15 : Harmonic Constituent Structure, (mm. 5-6).

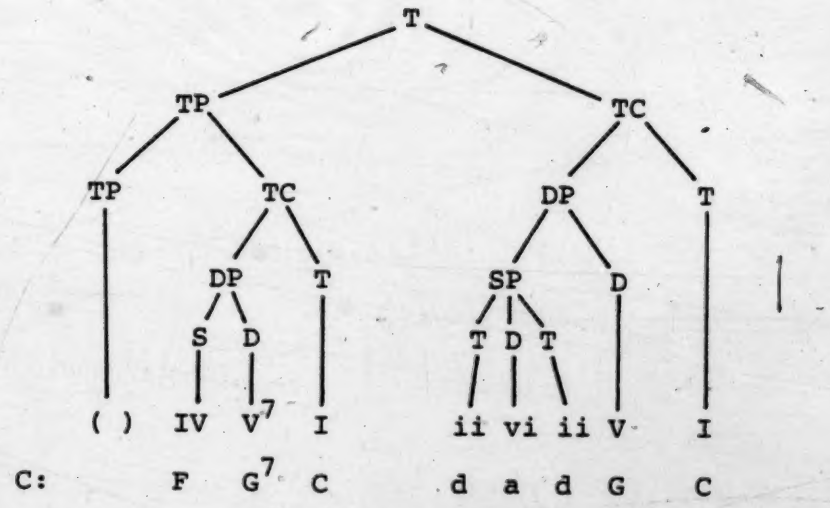
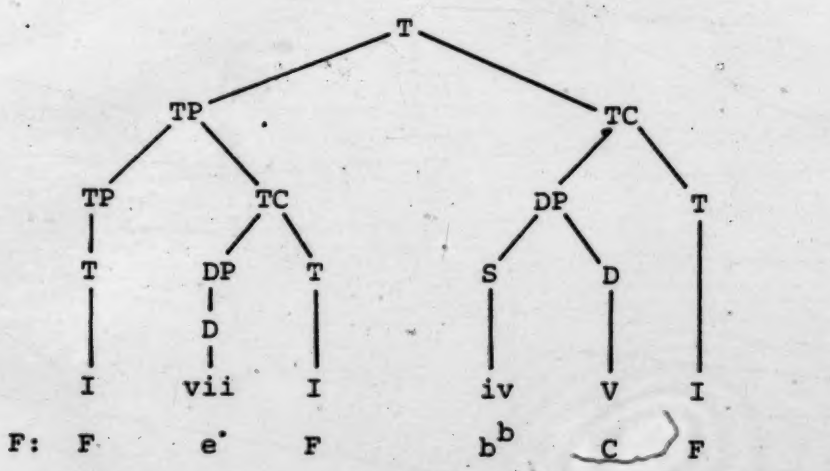


Figure 6.16 : Harmonic Constituent Structure, (mm. 7-8).



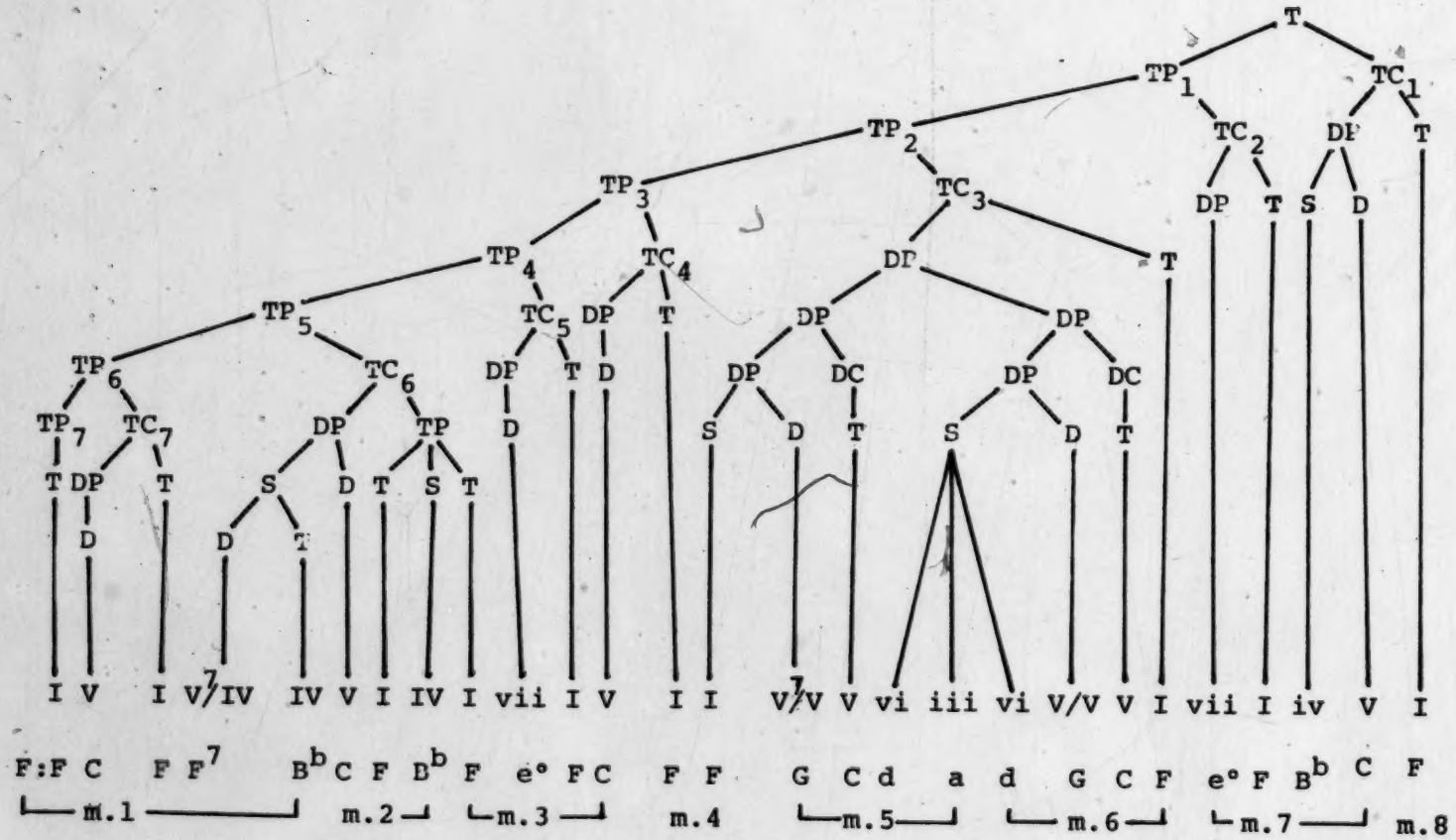
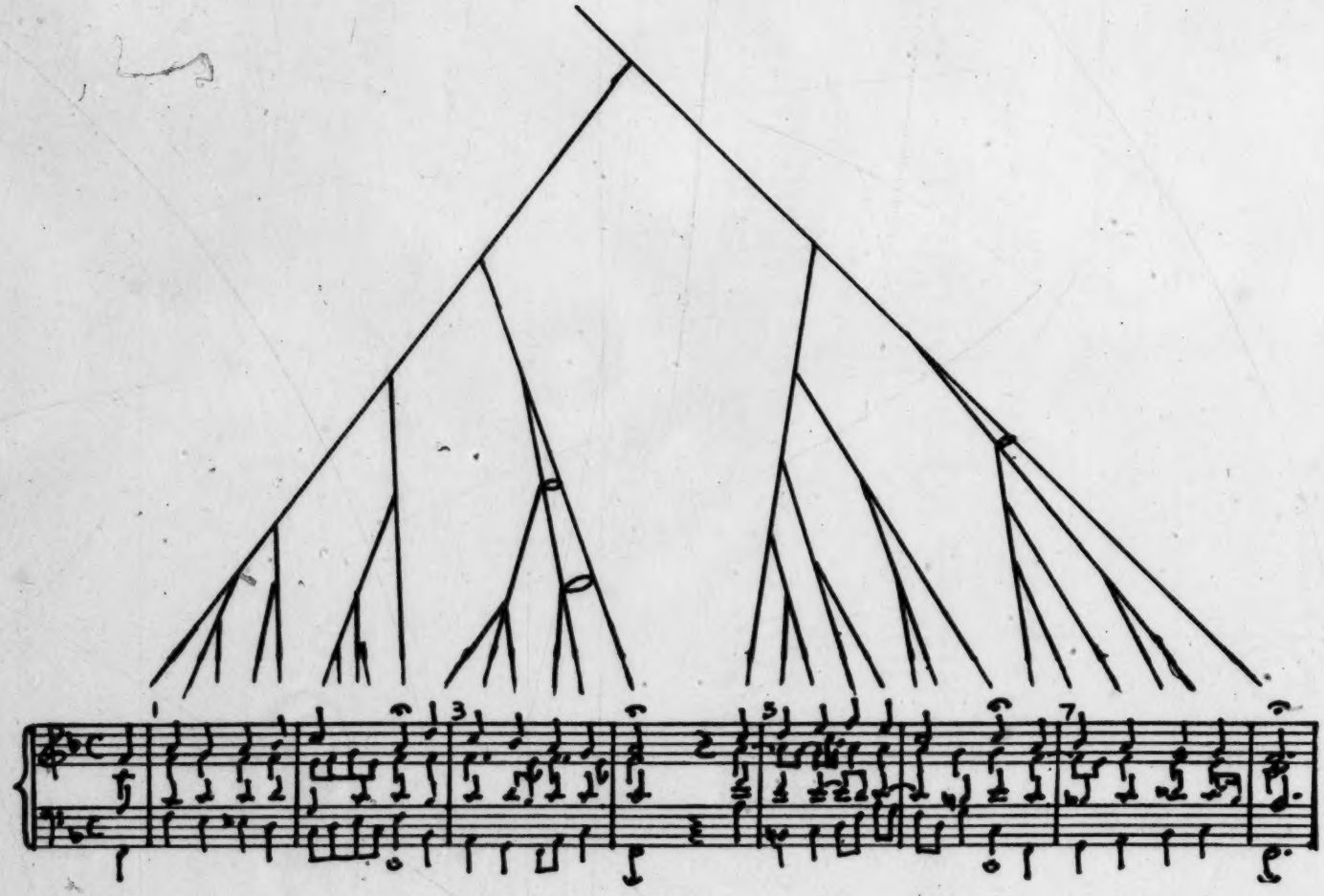


Figure 6.17: Harmonic Constituent Structure, (mm. 1-8)



Example 34. J.S. Bach, "Christus, der ist mein Leben." Time-span Reduction.

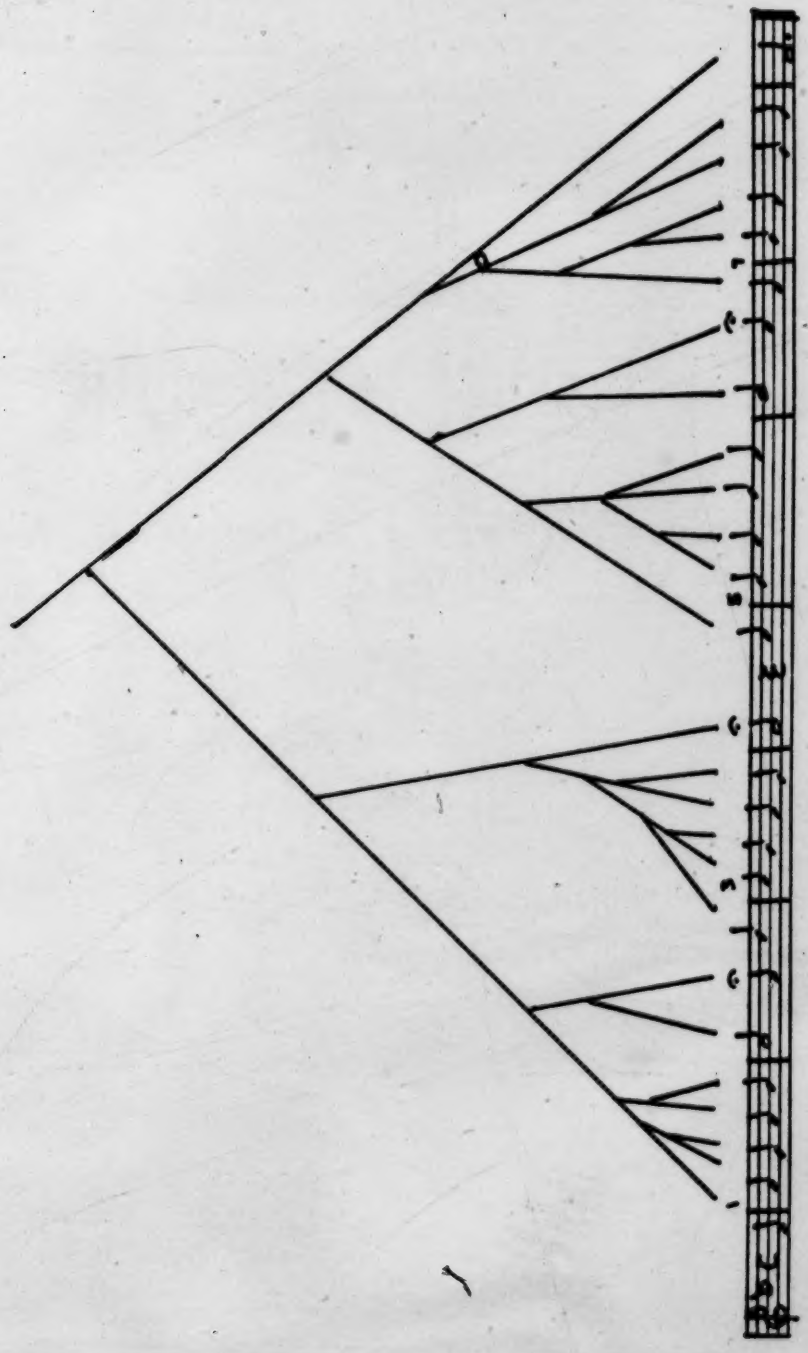


Figure 6.18: Time-span Reduction of the Melody.

gation of the dominant in m.2. The time-span reduction shows the subdominant on beat four of m. 2 as a left-branching elaboration of the tonic chord that follows it, but it does not show how the tonic harmony which precedes it is prolonged across the grouping boundary indicated after the third beat of m. 2. The varying interpretations of chord functions shows the ambiguity which is always present to a certain degree when describing music structure. The ability of harmonic function to move across boundaries -- either grouping or metric (time-span) boundaries -- is a factor which accounts for the ongoing sense of forward motion in music. The fact that the subdominant in m. 1 is not only an outgrowth of what has preceded it but an indicator of what is to come ties the individual segments of musical structure into a coherent whole.

The varying segmentations provided by the deep structure illuminate functions which might not be apparent from an examination of only one viewpoint. They indicate the ambiguity present in the music which creates tension which is an important factor in musical expression. Finally, they are an important factor in the perception of forward motion in the music. Only an examination of all aspects of the deep structure can account for the complexities which underlie a musical work and enrich our perception and understanding of that work through a knowledge of their interaction.

NOTES

[1]Keiler, "Bernstein's The Unanswered Question," p. 216.

[2]Fred Lerdahl and Ray Jackendoff, "Toward a Formal Theory of Tonal Music," Journal of Music Theory, 21 (1977): 113.

[3]Lerdahl and Jackendoff, A Generative Theory, p. 157.

CHAPTER SEVEN: CONCLUSIONS

In the preceding chapter an attempt was made to show how an analysis of deep structure could uncover syntactical relationships in the pitch and rhythmic structure of a piece of music which may not be apparent on the musical surface, or may only be intuitively apprehended. Such analyses can expose structural parallelisms which may bear significantly on the perception of form and coherence in a musical work. There are other areas of musical inquiry which would benefit from the adoption of an analytic viewpoint which makes reference to the principles of transformational grammar and deep structure in particular.

One area that would warrant further investigation is that of stylistic analysis or style criticism. The musical competence involved in an understanding of tonal music has been described by means of the deep structure components outlined in the preceding chapters. The types of syntactic relations found in tonal music and the means by which these structures could be transformed were discussed, thus describing a large class of possible analytic models. No rules for the combination of these structures or their use in specific contexts were posited. A series of rules, or constraints, which would govern the combination and use of the possible structures available, would provide

a means of stylistic description based on explicit analytic facts.

Judith and Alton Becker have discussed the function of constraints in defining a particular musical genre or system.

> Musical systems can be described as a hierarchy of constraints in which the highest level constraints operate on all music of a given tradition, as tonality does for Western European music. . . . All constraints in a genre are not of equal force. Some constraints are of such force that if one breaks them, one could no longer consider the sequence an instance of that same genre. 1

Adopting this idea, a musical style, then, could be characterized by the constraints placed upon the choice of musical material available to the composer. Although the musical surfaces of two works would not be identical, yet they might be readily identified as members of the same class (for example two canons or two symphonies from the classical period); it can be concluded that the constraints are operational on a deep structure level. It is not the specific rhythmic pattern on the music surface where the constraint is operational but the choice of possible metric deep structures and permissible transformations of that structure which are constrained. The description of a particular genre or a specific stylistic school or historical period, would be based upon the constraints which govern the choice of metric, harmonic and melodic deep structures used in the piece, and which make that work

representative of the genre or period in question.

Within a genre or style so defined, the originality and creativity of a particular member of that class would stem from the ways in which the possible deep structures are transformed into musical surfaces, expanding the material to its limits while still adhering to the constraints of the genre. Such a type of activity is called rule-governed creativity. Ruwet describes this as creativity dependent upon competence and it is the result of the recursive power of the rules which make up a system. This concept stands in opposition to rule-changing creativity where performance can end up changing the system.[2]

An approach to style description involving the concepts of rule-governed and rule-changing creativity is not unlike the traditional developmental ideas of style criticism. The use of the transformational model could simply lend the method a more explicit analytic basis from which to proceed. An examination of the tonal system could be made in a similar vein, with the so-called rule-changing creativity of certain composers or certain works being responsible for the development of new syntactical functions between chords which were not permissible under the constraints of other stylistic periods.

Returning to the matter of stylistic analysis, reference to musical deep structure can provide an objective basis for the study of a composer's personal style. It

may be said that Bach's style is "pure" or Beethoven's "dynamic," and so on. Such words can only convey vague ideas as to the nature of the music and are totally subjective, based as they are on an interpretation of the analytic facts rather than a statement of them. With reference to an analysis of deep structure, one can move beyond a description of the surface phenomena that characterize a work to the types of structural organization which a composer uses in a piece. When examining the style of a composer, one can determine what types of structural functions contribute to the uniqueness of that style. For example, Bach's style may sound "pure" because the structure is relatively non-transformed on the musical surface while Beethoven's style may be perceived as "dynamic" because of the use of grouping overlaps at cadential points and so forth.

When comparing the styles of two composers, this sort of analysis can provide a more concrete means of comparing the two. Rather than simply noting the differing impressions created by the two different styles, one can compare the methods used by each composer and determine which aspects of structure account for the difference between the two.

Another area where the development of a transformational model of music structure would be useful is the study of music perception. The means by which an individual

perceives the syntactic structures in a piece of music is a matter of performance. As stated in Chapter One, performance is ideally based on a study of the underlying competence. An hypothesis about the types of structure which listeners perceive in music is necessary before inquiry into how those structures are perceived by an individual or why they should be heard as such. Once such an hypothesis has been formulated, as in the grammar of tonal music presented by Lerdahl and Jackendoff,[3] a study of musical perception can proceed on a firm theoretical basis.

This paper has confined itself to an examination of the structure of tonal music in the common-practice period. Such an examination of syntax, resulting in the formation of other musical grammars, can be applied to other musical idioms. One area that has been open to this type of exploration is ethnomusicology, and the resulting findings constitute a significant portion of the relevant material on the subject.[4] Musical grammars can be constructed for other periods in Western musical development, such as for medieval music or twentieth century styles.

With a class of musical grammars thus established, an interesting area of exploration is that of musical universals.[5] Such an endeavor would try to determine which types of syntactical relations form part of the competence used to understand all musics, and which are specific to

a particular idiom. For example, do all types of music involve some form of hierarchical segmentation of the music surface as defined by grouping structure? (Lerdahl and Jackendoff think that it does.[6]) Is a hierarchy of pitch functions universal, with the specifications for consonance and dissonance or pitch relations being specific to the particular idiom?

Knowing which aspects of music competence are universal can play an important role in understanding perceptual and aesthetic problems. Regardless of whether the acquisition of musical competence is innate or learned, a listener brings the competence for any style, such as the tonal idiom, to his attempts to understand another idiom. Those aspects of competence which are universal will present no perceptual problems, but there will be difficulties both when familiar structures, such as pitch hierarchies, are organized along different lines, and when new types of syntactical organization are employed. (For example, in the genre "Srepegan," described by Judith and Alton Becker,[8] contour of melodic line is structurally important while pitch hierarchy is not.)

Alfred Pike mentions some of the problems for listeners first confronted by an "atonal" piece.

> The expectations of listeners who are unfamiliar with the atonal style will constantly be mistaken and inhibited. They will hear traces of tonal form in these alleged "atonal" works by selecting isolated sound terms without reference to their construction. When

> a person learns the syntax of a foreign language, he does not confuse the meaning of words which have the same sound in his native tongue. Certain mental adjustments must be made to a new set of values while belief in the old system is temporarily suspended. 9

Twentieth-century music presents particular problems in an analysis of deep structure, because much of it does not conform to the premises on which the analysis is based. The deep structure concept described in this paper examines hierarchical functions and is used to uncover structural parallelisms which may not be apparent on the musical surface. Repetition is rejected as a structural principle in some twentieth-century music and so in those cases the attempt to find evidence of large scale parallelism on an abstract level is futile. Furthermore, the syntax of much of the music is not organized in terms of hierarchical function. For example, because of the lack of repetition or structural parallelism, large-scale grouping structure can only be inferred from local detail on the music surface. In many cases the rhythmic structure is also not organized hierarchically.

Example 35 shows a case where a rhythmic hierarchy is lacking despite the use of conventional metric notation. The use of 2/4 meter implies a metric structure but in actuality functions as little more than a notational convenience to segment the score into conventional units for easy understanding. At this point there is nothing to suggest a pattern of alternating strong and weak pulses

Example 35. Stravinsky, The Rite of Spring, Opening Scene, "Dance of the Youths and Maidens," mm. 1-8.

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the quarter-note level. There is no pitch movement to establish a rate of motion other than the obvious eighth-note level. The bowing indicates no stress is to be placed on the first eighth in each measure, as would have been expected were the time-signature functional. The accents in the string parts, which coincide with the horn entries, do establish a series of strong pulses but they are not organized at intervals of two or three beats nor are they extended beyond the level on which they occur to establish metric levels of two or four measures. (Though metric hypermeasures of two and four measures are not established, the grouping structure could be interpreted in such a manner, thus fulfilling some of the listener's expectations.) Many other contemporary compositions exhibit even less adherence

to some sort of metric structure.

The lack of hierarchical structure poses a serious, perhaps insurmountable problem to a deep structure analysis of those pieces involving such types of musical organization. If the syntactical relations which determine the structural meaning of a piece are contained on the musical surface, there will not be an underlying level through which those relationships gain their meaning. If the phenomenal accents in the Stravinsky excerpt do not establish a hierarchical pattern of strong and weak pulses, there is no abstract level of metric relationships which can determine whether a syncopation, a transformation of metric pattern, exists on the music surface. Thus there is no abstract level of structure below the music surface; no deep structure which determines structural meaning.

Such a problem exists in all parameters where hierarchical structure is not employed. Pitch hierarchies can be established by means other than the tonal system, and in such cases a deep structure, reflecting the relationships between stable pitches and their prolongations will be possible. In other cases, no deep structure can be attributed to the music. Contemporary music employs other means of syntactical organization, often involving parameters which do not function as independent entities in tonal music, instead of the hierarchical structures found elsewhere. For example, dynamics may be organized as an

independent parameter in totally serialized music or timbre may be organized independently of melodic idea. Generally though, these aspects are not organized hierarchically and so are not susceptible to a deep structure analysis.

Deep structure, then, is limited to an explanation of hierarchical organization in music. Where such methods are not part of the organization of a piece, the concept will not function. Deep structure represents the syntax that the listener attributes to the music in order to perceive its structural meaning. Defined as such, compositional systems such as those which underlie many contemporary pieces would not be considered deep structures. They do not represent mental concepts which the listener infers from the musical surface and attributes to the piece as part of the process of musical cognition.[10]

Deep structure is used explicitly to demonstrate structural features which are not apparent on the musical surface. It is a means of uncovering structural parallels which closely affect the perception of form and coherence in a musical work. Because of its explicit and objective nature, the concept can serve as a solid basis for discussion of stylistic analysis. An explicit grammar of music, which includes the deep structure concept, is a necessary basis for any theory of music perception.

One problem involved in the use of transformational grammar for music analysis concerns the fact that some

parameters of music cannot be described in terms of grammatical or ungrammatical constructs, melodic structure being the most difficult to classify in this manner. The fact that melodic ideas cannot as yet be grouped into those which are permissible and those which are not, poses a problem for the transformational component of the grammar. With a virtually unconstrained set of permissible constructs, there are no restrictions on the type, number or order of transformations which a melodic idea may undergo.

Lerdahl and Jackendoff cite this problem as one of the reasons why they do not pursue a deep structure as part of their grammar for tonal music.[11] The fact that one area of music cannot be explained totally by the deep structure concept does not negate the fact that the concept functions in music and that it is successful in explaining other aspects of musical syntax. Lerdahl and Jackendoff do make use of the concept to explain certain ideas in their grammar and more significantly they make reference to an underlying level of structure in their discussion of grouping overlap and elision,[12] and to a "common abstract structure" which underlies a piece such as the Goldberg Variations and explains why the variations are perceived as a group.[13]

As stated previously, the use of linguistic notation can provide a measure of objectivity lacking in other methods of analysis. Furthermore, the tree notation is

adaptable to the type of organisation being represented in music since it is also based on a hierarchical segmentation of a string of contiguous elements. However, the particular representational methods employed here are lacking in some areas.

First of all, the notation of the harmonic constituent structure is specific to the tonal idiom. New prolongational categories must be posited and new relationships between them established before the notation could be used to describe the harmonic structure of another idiom. Lerdahl and Jackendoff's prolongational structure[14] accounts for many of the same intuitions and is more easily adaptable to other idioms but was not used in this paper. Their structure does not include the functional categories of tonic, subdominant and dominant. The present writer feels that the concept of harmonic function, not simply harmonic movement away from or to areas of tension or relaxation, or more or less stable and consonant areas, is necessary for a fully explicit explanation of harmonic structure. The concept of embedding, which is based on those functions shows certain aspects of harmonic prolongation which the notation for prolongational structure does not clearly indicate. For these reasons, even though the notation is more restricted in terms of an explanation of music structure in general, Keiler's notation more clearly captures the harmonic syntax which functions as part of the deep

structure of tonal music and so was adopted in this paper.

One problem with Keiler's notation is that it is predicated upon the prolongation of the tonic triad (or that chord which is functioning as the local tonic). There are many cases where the tonic triad may serve to prolong the dominant, as in the Haydn analysis in Chapter Six. Certain of these instances may be explained by positing the I^{6}_{4} as a subdominant function constituent. However there are cases where a root position or first inversion triad will be heard as prolonging the dominant. (See, for instance, Example 33, m. 5, where the tonic triad functions as part of a large-scale dominant prolongation.) The constituent structure could show this by having a phrase structure rule by which the DP function could be rewritten as D + S + D in the same manner as TP $\rightarrow$ T + S + T. However, since the rules used have not been context-senstive,[15] there is nothing in the theory to explain when a tonic triad would function as a subdominant prolongation of the dominant and when it would remain a tonic triad. In the context of an analysis, reference to the time-span reduction would likely reveal that the dominant triads which surround the tonic were chosen as time-span heads because of strong metric position, or some other confluence of rules which would cause the less stable dominant triad to be chosen as time-span head. The importance of the dominant in terms of the time-span reduction would influence the perception of dominant rather

than tonic prolongation and would explain why the function of the tonic triad is different from that normally illustrated by root position or first inversion tonic triads. The fact that the constituent structure cannot account for this perception remains a weakness of that aspect of the theory.

With reference to the time-span reduction, it is subject to a certain notational awkwardness, especially when a reduction of a larger-scale piece is attempted. The tree notation itself is intricate and somewhat confusing and may result in the confusion rather than the clarification of analytic points. A secondary musical notation is needed in more complex examples than those included in this paper (which Lerdahl and Jackendoff use in their book),[16] thus making the tree notation itself somewhat redundant. Since deep structure is proposed here as an adjunct to, not a replacement for other types of analysis, in some cases another form of notation for the explanation of the melodic structure (most notably the Schenkerian model) would ultimately be of more benefit. (However, the concept of right- and left-branching elaborations of melodic pitches can be useful to an examination of melodic structure and should be utilized where appropriate.)

In terms of metric and grouping structure, the notation seem satisfactory and the concepts adequate to explain the complexities of rhythmic organization. The tree notation is not adequate to express the many possible levels

of motion and rhythmic complexities which are found on the musical surface in a single diagram. The separation of grouping and meter is an important step in the description of the rhythmic aspect of music and the analysis is generally useful in explicitly detailing the influence of the metric structure on musical form, a point that is not always covered by other types of analysis.

In summary, it may be concluded that a deep structure level does exist for tonal music and its explication can prove beneficial to an understanding of the structural makeup of a musical work.

NOTES

[1]Judith and Alton Becker, "A Grammar of the Musical Genre Srepegan," Journal of Music Theory 23(1979): 3.

[2]Ruwet, A Generative Grammar, p. 28.

[3]Lerdahl and Jackendoff, A Grammar of Tonal Music.

[4]See among others Becker, op. cit.; John Blacking, "Deep and Surface Structure in Venda Music," Yearbook of the International Folk Music Council 3 (1971): 69-98; Vida Chenoweth and Darlene Bee, "Comparative-Generative Models of a New Guinea Melodic Structure," American Anthropologist 73 (1971): pp. 1-32.

[5]Lerdahl and Jackendoff, op. cit., pp. 278-281.

[6]The summary of the rules of their grammar in Lerdahl and Jackendoff, op. cit., pp. 345-352, indicates which aspects of the theory they believe to be universal.

[7]See Ibid., pp. 281-283 for a discussion of whether or not music universals are innate.

[8]Becker, op. cit.

[9]Pike, A Phenomenological Analysis, p. 74 Footnote 18.

[10]Lerdahl and Jackendoff, op. cit., p. 298.

[11]Ibid., p. 286.

[12]Ibid., p. 60.

[13]Ibid., pp. 105-106.

[14]Ibid., pp. 179-249.

[15]Koutsoudas, Writing Transformational Grammar, pp. 19-20.

[16]See for example Lerdahl and Jackendoff, op. cit., p. 115 or p. 144.

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